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The Content of a Course in the Introduction to Education

VELORUS MARTZ, Professor of Elementary Education,
Indiana University

SOME time ago, in the School of Education, we became interested in the problem of the content of the course listed in our catalog as "Introduction to Teaching." It does not require an extensive acquaintance with the textbooks in this particular field to reveal that there is an apparent lack of agreement among them as to the aims which such a course should serve and the specific items of information that should enter into its make-up. As Introduction to Education is one of the courses required at Indiana University of all students preparing for an elementary teaching license, it was believed that an effort to determine the type of course that would best serve the needs of young elementary teachers might be of more than mere academic interest.

Several studies of this particular problem had already been reported. In 1931 Reinhardt had secured from 43 teachers colleges data as to the aims and content of the introductory course in education as given in these institutions.[1] She was not altogether pleased with her findings, however, as she believed that most of those replying had merely given a list of the major topics in the textbook used, as an outline of the course. Her conclusion was that the nature of the course in the institutions covered by her investigation was determined chiefly by the textbooks. This suggests that an analysis of available texts might give us a fair cross-section of the essential content of the course under consideration. Such an analysis was made by Gerber in 1933.[2] He studied 11 textbooks in this field and classified the topics discussed under 15 heads. The lack of any essential agreement among these books is indicated by the fact that no one of these topics was treated by all the texts studied; three of them were discussed in one book only. Conversely, no one book treated all the topics listed. The greatest number found in any one book was 12; in one other text only four of the topics were treated.

The difference in emphasis accorded to topics discussed is suggested by an extreme case in which 75 per cent of one book was devoted to "The Teaching Process," whereas less than five per cent of another was given to the same topic.

A similar study of textbooks, though somewhat more elaborate, is that reported by Burton and Ibanez in the *Journal of Educational Research*, November, 1935.[3] In this case, 21 books were investigated, but the results were not substantially different. Only one topic, "The Edu-

[1]Reinhardt, Emma. "General Introductory Courses in Education in Teachers Colleges." *Elementary School Journal* 32:57-66, September, 1956.

[2]Gerber, Lee O. "An Analysis of Some Books Used as Texts in Introductory Courses in Education." *Educational Administration and Supervision* 19:652-6, December, 1933.

[3]Burton, William H., and Ibanez, Dalmyra M. "Introductory Courses in Education." *Journal of Educational Research* 29:171-86, November, 1935.

cational Process," appeared in all the texts analyzed. Emphasis and manner of treatment varied greatly from book to book. Several topics that the investigators thought of prime importance were not touched upon.

In these studies, the object apparently was to determine the content of the course, Introduction to Education, as indicated by the texts in this field or by the syllabi of the institutions offering such a course. The present study, reported in this paper, differs from the preceding ones in that it is concerned chiefly with what ought to be in an introductory course to education, as seen by those who have had such a course or by others who have to deal with young teachers who have had such a course. It was this purpose that determined the procedure adopted in pursuing the investigation. The plan was to analyze a sufficient number of texts to secure a detailed and comprehensive outline of the objectives and topics that are likely to be found in an introductory course of the type under investigation. This outline was then reduced to a list of somewhat reasonable length and submitted in the form of the inevitable questionnaire to a random selection of students and teachers who were asked to indicate the relative value of the aims and topics therein suggested. The plan was carried out substantially as indicated. The actual work throughout the study has been done by Dr. W. I. Painter, research assistant in the School of Education. My own relation to the project has been merely that of director and, on this present occasion, that of reporter.

The first stage of the investigation comprised the detailed study and analysis by topics of 14 books written as texts for introductory courses in education. This part of the work was begun three years ago and was practically completed before the publication of the similar study by Burton and Ibanez mentioned above. In our own case, each book was read painstakingly and each distinguishable topic listed. The amount of space given to each topic was recorded in terms of lines. The record for each book was kept separately, so that in the end it could be known in how many books each topic was discussed and how much space had been given to it in all the books or in any one.

The resulting list contained 127 major topics. As in other similar studies, a striking lack of agreement among the texts was revealed. Of the 127 topics, only one, "Types and Organization of Curriculum," was treated in all 14 books. On the other hand, 13 topics were mentioned in but one book each; only 10 topics were discussed in more than 10 books each. There were 31 topics found in eight or more books as against 96 topics that occurred in seven or less of the 14 texts studied. In other words, three-fourths of all the topics discussed were treated by not more than half of the books analyzed. A comparable variation was discovered in the amount of space devoted to any one topic by the books in which it was discussed. "The European Background of American Education" was given attention in nine of the books. In one of these it received 1,428 lines; in another, 19 lines.

Since it was thought desirable to compare the ratings, given these topics by those to whom the questionnaire was sent, with the importance accorded them by the texts, an attempt was made to rank them on the

basis of the consideration given them in the texts. This proved a rather complicated problem because of the necessity of balancing number of mentions in different books against amount of space. For example, if a topic receives mention in nine books to the extent of 1,200 lines, is it more or less important than a topic that is discussed in only seven books, but receives 1,500 lines? In an effort to answer this question, the two scores which each topic had (mentions and space) were reduced to T scores and the mean of these T scores was taken as the final rating of the topic. They then were ranked on the basis of this mean.

It would only be confusing to attempt to present the rankings of all the 127 topics, but the 10 topics that stood at the top and the bottom of the list are indicated in Table I.

TABLE I. THE FIRST AND LAST 10 TOPICS OF THE 127 TOPICS DISCUSSED IN 14 TEXTBOOKS, RANKED BY T SCORES

Rank	Topic	T Score
1	Curriculum, Types, and Organization	84.5
2	Training and Equipment of Teachers	82.1
3	Methods	79.1
4	Original Equipment and Growth of the Child	73.9
5	Aims, Objectives, and Ideals of Education	73.1
6	General Characteristics of the Teaching Profession	68.9
7	Public School Finance	66.2
8	The Teaching Process	64.7
9	European Background of American Education	64.6
10	Functions and Values of Education	62.4
118	Thrift Education	39.4
119	Factors Affecting Teacher's Work	39.0
120	Physical Education	38.3
121	Conditioning Learning	38.1
123.5	Instructional Materials and Their Use	38.0
123.5	Teaching Efficiency	38.0
123.5	Advantages and Disadvantages of Types of Tests	38.0
123.5	Relation of Education to Individual Efficiency	38.0
126.5	Factors Influencing Test Results	37.9
126.5	Elements of a Good School	37.9

With this list of items, derived from the analysis of the texts as a basis, the questionnaire was developed. This varied somewhat from the list of topics in two respects. A catalog of suggested functions that an introductory course in education should serve was added; several of the topics were broken down into more specific detail by further analysis. The statement of functions is primarily a formulation of the present investigators, rather than a selection of items found in the sources consulted. It represents their conclusion as to the purposes and objectives that the material found in the various textbooks seem designed to serve.

The possible functions of such a course were indicated in the questionnaire as follows:

1. To introduce students to the scientific study of education.
2. To point out the evolution of our educational system.
3. To point out the general nature of the teaching profession.
4. To give an understanding of the organization of our present educational system.
5. To motivate the study of education.
6. To present a comprehensive view of educational theory and practice.

More specific subheadings were attached to each of these statements. In connection with number 3, the function of guidance in the selection of teaching as a career was stressed.

In the second part of the questionnaire the items or topics from the basic list were grouped under 11 large heads as follows:

1. History and Development of Public Education.
2. Administrative Organization for Control and Support of Education.
3. Characteristics of the Teaching Profession.
4. Scientific Management of the Classroom.
5. Aims, Purposes, Functions, and Value of Education.
6. Curriculum, Course of Study, and Materials of Education.
7. Nature and Psychology of Learning.
8. The Teaching Process.
9. Teaching Efficiency and Its Measurement.
10. The Sociological View of Education.
11. Miscellaneous.

After the topics were arranged under these headings, several of them were further analyzed in some detail, e.g., "The European Background" was broken into time periods, as Grecian, Roman, Mediaeval, etc. This increased the number of items in the questionnaire until there was a total of 221 to be checked. Three columns were provided for checking each item. A check in the first column would indicate that the item was considered of high value or importance; in the second column, of moderate importance; in the third column, of little importance. Items which were regarded by those answering the questionnaire as having no legitimate place in an Introduction to Education were not to be checked. The investigators were aware that, under this instruction, many items might go unchecked simply because certain individuals would be in doubt as to their value. But it was thought that this would be better than to have them ranked by mere guess.

Approximately 500 copies of this questionnaire were distributed to three types of individuals. The first type was made up of students still in the training school who were approaching the end of their training course and who had had the course, Introduction to Teaching. These were selected as those who would have the course relatively fresh in mind and who could appraise it with reference to its value in aiding them to understand and organize the material presented in other courses in the teacher training curriculum. The second group was composed of young teachers in service with experience of not over five years,

chosen as those close enough to college days that their memories might not be too much blurred and yet in a position to render judgment on the basis of experience. The third group consisted of superintendents, supervisors, and principals who were thought to be in a position to know the needs and desirable qualifications of young teachers. About 220 questionnaires were sent to each of the first two groups, leaving 50 or 60 to be distributed to superintendents and supervisors.

Since our interest was primarily in our own local problem, the investigation was restricted very largely to the state of Indiana. The exceptions to this would be due to out-of-state students in our summer school last summer, several of whom accepted and checked the questionnaire. Students in college were reached through their instructors who had consented to coöperate with us in the study. Several of these failed to return the questionnaires, but eventually replies were received from eight institutions, five of which are in Indiana: Butler University, Manchester College, Ball State Teachers College, Indiana State Teachers College, and Indiana University. Three out-of-state institutions sent in returns: Greeley State Teachers College in Colorado, Eastern Illinois Teachers College, and the University of Kentucky.

The per cent of returns was not high. The college group was best represented with 143 returned questionnaires. There were 69 received from teachers in service and 29 from administrators and supervisors. This gives a total of 241 returns, or about 50 per cent of the whole number distributed. The data were tabulated for each group separately and within the group for each of the three columns separately. Then columns 1 and 2 were added, as indicating items of sufficient importance to deserve a place in any course in Introduction to Education. The third column was added likewise to the omissions. Third column checks and omissions are to be regarded as indications that the item is of slight importance and may be omitted from a proposed course without harm. Percentages were figured for each column and for the two combinations. Where the combined total of columns 1 and 2 exceeded the combined total of column 3 and the omissions it was thought that such items must be regarded as of distinct value. Where this total was less than 50 per cent, the value of the item might well be considered problematical.

Perhaps a concrete illustration might make the treatment of the data somewhat clearer. Of the 143 students in Group I, 22 checked "Colonial Beginnings" (item "a" under "2") in column 1; 51 checked it in column 2; 33, in column 3; 37 omitted it. This gives percentages of 15.4, 35.7, and 23.1 for columns 1, 2, and 3, respectively. When we add columns 1 and 2, we get 73, or 51.1 per cent, as against 70, or 48.9 per cent for column 3 plus the omissions. Thus, this item is left very close to the border line so far as the student group is concerned. The complete data on this item, in tabular form, would appear as follows:

TABLE II. SAMPLE OF THE TABULATION AND TREATMENT OF DATA ON EACH OF THE VARIOUS ITEMS INCLUDED IN THE QUESTIONNAIRE

Item	Frequency			Percentage				
	I	II	III	I	II	III	I and II	III plus omissions
Education in America								
(a) Colonial Beginnings—								
143 students	22	51	33	15.4	35.7	23.1	51.1	48.9
69 teachers	24	53	8	34.8	33.4	11.6	68.2	31.8
29 administrators	11	14	4	38.0	48.3	13.7	86.3	13.7
Total	57	88	45	23.6	36.5	18.7	60.1	39.9

The totals for all groups indicated in the above table have not as yet been computed due to the fact that some of the returns have been but lately received. But when it is considered that 15 computations of percentages for each of the 221 items in the questionnaire have already been made, some idea of the immense amount of detail involved in the study may be secured.

There are four ways of checking each item: as of high, average, or minor value, or of no value at all. In the grand total no one of the 221 items failed to be rated on each of these four levels; that is, every item was rated as of high value by some and as of no value by others, while also receiving a fair share of votes for the intermediate positions. In the separate groups, however, some spaces were left entirely blank. With one exception these were all in the administrator group. The item, "Original Equipment of the Child," was not rated as of "minor value" by any one of the teacher group, though some omitted it as being of no value. The administrators refused to check three items in column 1. These were the Greek, Roman, and Mediaeval periods in "The European Background of American Education." This is rather remarkable, as this group is more prone than any other to rate items uniformly high. To even matters up, apparently, they have left the third column blank in 13 instances. Six of these are items under the "Sociological View of Education," three are traits of the teacher of a social nature, and two are aims and functions of the school. The other two are the "General Nature of the Learning Process" and "Sources of School Revenue." On the whole the student group gives the lowest ratings and the administrators, the highest. The teacher group stands consistently between the other two. Whether this is due to the students having the most vivid memory of the introductory course, or to a lack of experience that enables them to appreciate its value, it is not possible at the present time to say.

Of the items under "Functions" at the beginning of the questionnaire, all received a favorable vote (i.e., more than 50 per cent in

columns 1 and 2) except "Comparison of Our Educational System with Those of Foreign Countries." All groups are agreed that this is a distinctly minor function of an introductory course in education. All the other functions here stated are accepted as legitimate, though the student group is not enthusiastic about the "Evolution of Our Educational System."

When it comes to content of the course, all groups agree again that the "European Background Prior to the Reformation" is of but little significance. All other items and phases of the "Development of Education" are approved except "Early Policies of the Eastern States," which receives a negative vote from students and teachers. Even "Comparative Education" under this head is unanimously endorsed in spite of the unfavorable opinion expressed of it under "Functions." This suggests that here it is interpreted as comparison of differing aims, curricula, etc., rather than of systems of various countries.

The students, rather characteristically, are apathetic towards many items under "Administrative Organization" and would be quite willing to omit them. However, only two items fall below a 50 per cent vote in all three groups. These are "Non-State Educational Agencies" and "Forms of Budgeting and Accounting." "Characteristics of the Teaching Profession" is approved without a dissenting vote on any item. This is the only classification to escape entirely an unfavorable vote. With two exceptions, all items under the next five headings, "Classroom Management," "Aims and Purposes," "Curriculum," "Psychology of Learning," and "The Teaching Process" are endorsed, though the students keep registering dissatisfaction rather regularly. But on the "Evolution of Various Phases of the Curriculum" and "Origin of Each Method" the other two groups join with the students and these are voted out unanimously.

On "Measurement of Teaching Efficiency" the students apparently have a complex. They vote adversely on all items except "General Uses of Tests" which they allow to slip through on the narrow margin of 51.1 per cent. Measurements are upheld generally by the vote of the other two groups. However, when it comes to statistical treatment of testing and test results the administrators vote with the students and we shall probably have to omit these two items along with "Graphic Presentation of Data" which is eliminated by consent of all parties concerned.

The record on the "Miscellaneous" items is rather erratic. True to form, the students reject more than half of the 20 items listed under this heading. They give "Janitorial Service" only a 16.1 per cent vote —the lowest affirmative vote received by any item in the entire list. Their attitude on this item is shared by the teachers; only the administrators regard "Janitorial Service" of sufficient importance to be included in our course. Two other items in this section are adversely scored by two groups. "Technique of Research" is disapproved by students and administrators, approved only by teachers. On "Services of Auxiliary Agencies," teachers and students again join forces against the administrators. However, only one item in this last classification is unanimously rejected. It is "Nature and Functions of the School Sur-

vey," outlawed by the votes of all three groups. The teachers are alone in disapproving "Outstanding Philosophies of Education" by a fraction of one per cent. This is the single item rejected by any group that is not also rejected by the students, who in this case vote approval to the extent of 53.9 per cent.

By way of summary it may be noted that the administrators cast 14 unfavorable votes, the teachers 17, and the students 72, or more than twice the adverse votes of the two other groups combined. The vote by items stood as follows: 11 items were unanimously rejected by all groups; eight items received adverse votes from two groups; and 54 items were disapproved by one group only. In all instances but one, this single unfavorable vote was cast by the student group. Of the 221 items listed in the questionnaire, 148 were approved by all three groups, if we understand by approval that more than 50 per cent of all respondents in each group checked them in column 1 or 2.

The items most strongly approved are shown in the following tables:

TABLE III. ITEMS GIVEN FIRST RATING (COLUMN 1) BY 50 PER CENT OR MORE OF ALL RESPONDENTS IN EACH GROUP, COMPARED WITH RANKINGS ON BASIS OF TEXTBOOKS (T SCORES)

Item	T Score rank
Desirable personal traits of the teacher	2
Aims, ideals, and objectives of education	5
Nature and significance of individual differences	11
How to study	34
The home and its relation to education	71.5
Relation of the individual to the social group	81
Teacher-school relationship	94
Teacher's responsibilities and services	107.5

TABLE IV. ITEMS GIVEN FIRST OR SECOND RATING (COLUMNS 1 AND 2) BY 70 PER CENT OR MORE OF ALL RESPONDENTS IN EACH GROUP, COMPARED WITH RANKINGS ON BASIS OF TEXTBOOKS (T SCORES)

Item	T Score rank
Desirable personal traits of the teacher	2
Aims, ideals, and objectives of education	5
General functions and value of education	10
Specific functions and value of education	
How to study	34
The community and its relation to education	60
The home and its relation to education	71.5
Ethics of the teaching profession	73.5
The social group and its relation to education	79
Relation of the individual to the social group	81
Teacher-school relationship	94
Teacher's responsibilities and services	107.5

These 13 items cannot be specifically ranked on the basis of the data at hand but there is no doubt that they stand at the top of the list, being approved for inclusion in a course in Introduction to Education by more than 70 per cent of all those replying to the questionnaire. The correlation between this ranking and that obtained on the basis of the textbooks analyzed is not high. Of these items, only five appear among the first 13 on the book rank-list, while six of them would fall in the lower half of that list. The comparison between these two lists is a rather difficult one to make because the classifications and items are not identical in the two. The topics in the book list are larger and more inclusive generally than those in the questionnaire and this would tend to give them higher rank in any arrangement based on space and frequency of mention, as the book list is.

It should be borne in mind, at all times, that an item receiving a low score in this investigation is not necessarily to be regarded as of slight importance or significance. The study does not seek to evaluate the topics listed, but only to answer the question, "Should these things be included in a course in Introduction to Education?" We were reminded of this several times by our respondents who, in appended notes, explained their exclusion of an item on the assumption that it would be included in a later course.

The study would be more significant, undoubtedly, if a larger number of returns had been secured. Any conclusions based on evidence such as has been here presented must not be regarded as definitely established. However, we believe one or two things may be suggested, as indicated by the data already collected. The interest of those who have coöperated in this study seems clearly to be in the larger problems of education and teacher training, especially those involving social aspects and relations. There is a noticeable indifference to specific techniques and administrative detail as desirable content for an introductory course for candidates for teaching. Thus, budgets, curriculum building, specific methods, and testing techniques are given a secondary position or discarded in favor of aims and functions of education, social aspects of education, traits and duties of the teacher, and ethics of the teaching profession. The chief difference between the textbooks and the returns on the questionnaire used in this study lay along this line and may suggest a trend in public opinion that should not be altogether ignored.

In concluding this report, we should like to call attention again to the interesting attitude of the students whose replies at so many points were at variance with those of the other groups. They would apparently eliminate from an introductory course many topics now prominent in current texts and still approved by teachers in service and by administrators. Whether students fail to realize the value of these topics or have found them taken care of adequately in other courses, the evidence does not reveal. At any rate, consideration should be given their attitude. They are the ones to whom the course must be taught. If we do not wish to operate on the low plane of efficiency that inevitably results when we attempt to teach those who are uninterested, we must present material that appeals to the students as being eminently worth-

while, or tackle the problem of bringing them to realize the value of what we do present. In either case, we may expect our course in Introduction to Education to undergo a somewhat extensive revision in the future.

BIBLIOGRAPHY

List of the 14 texts in Introduction to Education analyzed in the present study.

Adams, J. E., and Taylor, W. S., *An Introduction to Education and the Teaching Process.* The Macmillan Co., New York, 1932.

Bagley, W. C., and Keith, J. A., *An Introduction to Teaching.* The Macmillan Co., New York, 1924.

Blackhurst, J. H., *Introducing Education.* Longman's Green and Co., Chicago, Ill., 1932.

Butterweck, J. S., and Seegers, J. C., *An Orientation Course in Education.* Houghton Mifflin Co., New York, 1933.

Clapp, F. L., Chase, W. J., and Merriman, C., *Introduction to Education.* Ginn and Co., Chicago, Ill., 1929.

Colvin, S. S., *An Introduction to High School Teaching.* The Macmillan Co., New York, 1917.

Cubberley, Ellwood P., *An Introduction to the Study of Education and Teaching.* Houghton Mifflin Co., New York, 1933.

Dearborn, N. H., *An Introduction to Teaching.* D. Appleton and Co., New York, 1925.

Drum, W. N., *A Preview of Teaching.* Ginn and Co., Chicago, Ill., 1928.

Frasier, G. W., and Armentrout, W. D., *An Introduction to Education.* Scott, Foresman and Co., Chicago, Ill., 1933.

Hissong, C., and Hissong, M., *Introduction to Teaching.* John C. Winston Co., Chicago, Ill., 1933.

Judd, Charles H., *Introduction to the Scientific Study of Education.* Ginn and Co., Chicago, Ill., 1918.

Schutte, T. H., *Orientation in Education.* The Macmillan Co., New York, 1932.

Selzer, C. A., and others, *Introduction to Teaching.* H. F. Temple, Inc., Westchester, Pa., 1931.

The Reorganization of Local School Districts in Ohio

T. C. HOLY, Professor of Education,
Ohio State University

THE topic of this paper may seem rather far removed from the problems ordinarily discussed in a conference on educational measurements and elementary supervision. My discussion deals directly with the type of school organization which, in terms of the Ohio law, will provide a more economical and efficient system of county schools. Since the goal in this program is to get large enough school districts and schools so that a well-balanced program of education can be offered at a reasonable cost, it does directly influence the fields of measurement and supervision. Larger districts and larger schools should provide better administration, better supervision, and better evaluation of the program of education offered. Hence, the field of school organization, like school support, does vitally influence every activity of public education.

The study which I shall describe here is an outgrowth of the general recognition of one of the major problems in the field of public education, that is, reduction in the number of administrative units or districts in the country. According to latest figures, there are approximately 127,000 local school districts in the United States, with about 500,000 school board members. This makes a ratio of approximately one board member for two teachers.

For a number of years the United States Office of Education has been interested in the problem of local school organization and has requested a grant from the Works Progress Administration to carry on such a study in a number of states. In December, 1935, this grant, amounting to $844,000, was made by the WPA to the United States Office of Education for the purpose of carrying on comprehensive studies of local school organization in ten states and of making recommendations for improvement. In selecting these states, use was made of three criteria:

1. Need for such a study in the state.
2. Likelihood of its results being used.
3. Interest of the State Department of Education in coöperating in such a study.

On the basis of these criteria, plus certain other considerations taken into account, the following states were selected: Arizona, Arkansas, California, Illinois, Kentucky, North Carolina, Ohio, Oklahoma, Pennsylvania, and Tennessee.

The study as organized in Ohio has Dr. D. H. Sutton, director of school finance in the State Department of Education, as the state project director and myself as associate director in active charge of the work. Its official title is the Study of Local School Units.

Before going into the details of the study as it is operating in Ohio, it is desirable to bring into the picture some legislation which is par-

ticularly significant in considering the possibility of using the results of the study.

There was enacted in Ohio on June 12, 1935, House Bill 466, generally known as the School Foundation Program. This program provided for an annual state subsidy for the public schools of the state of approximately $48,000,000 or about 60 per cent of the total current operating costs. Since the procedures in making this distribution are outside the scope of this paper, I shall not review them here. However, this bill has a provision for reorganizing the schools in the state which is very significant so far as the Study of Local School Units in Ohio is concerned. Quoted from that section of the bill is the following:

"On or before the first day of September, 1935, and on or before the first days of April, 1936, 1937, and 1938, each County Board of Education of the state shall prepare a diagram or map of the county showing the then location and position of all school districts therein, the location and character of roads, the location of streams and natural barriers, the location of each school building and of each route over which pupils are transported, together with a statement of the size and condition of each building and the number and ages of children attending the same. The territory in adjoining counties or in any adjoining city or exempted-village school district which, in the opinion of the County Board of Education, should be attached to or detached from any such county, city or exempted-village school district for the purpose of economy, efficiency and convenience, shall also be shown on such diagram or map.

"Upon completion of each of these surveys, the County Board of Education shall prepare a new diagram or map of the school districts in the county school district prescribing the transfers of territory, eliminations of school districts or the creation of new school districts which will provide a more economical and efficient system of county schools; and on or before June first, annually, shall adopt the same as the plan of school district organization.

"Upon approval of the director, such plan of organization within any county shall take effect upon a date to be fixed by the director, and thereafter no school district or parts thereof shall be transferred or the boundary lines thereof changed unless such transfer or change of boundary lines is in accordance with such adopted plan of organization."

Because of this requirement of the law, plus the active interest of the State Department of Education, the Study of Local School Units in Ohio was begun under very favorable circumstances.

When the study was begun in February, 1936, the first step was to enlist the coöperation of the county superintendents, since the data, in a large part, were to be collected in each county. From two to five workers, depending on the size of the county, were employed for approximately five months in the office of each of the 88 county superintendents in the state. The coöperation of these superintendents as evidenced by the fact that every one of them accepted the responsibility for directing his workers has been most commendable. Some 22 forms,

largely adapted from the "Handbook of Procedures," prepared by the Office of Education, were sent to the different county superintendents for the collection of data. In addition to these forms, 98 per cent of which were filled out and returned, we set out to get two maps for each county. One of these is a spot map and the other a bus route map. This makes a total of 176 such maps for the state. At the present time 171 of these are actually in our office, all of which have been put on tracings and planographed. Two hundred copies of each map, 8½" by 11" in size, have been made. A third map, showing the proposed new school district lines and permanent school centers, is also being prepared as rapidly as the programs to be recommended for each county are determined.

To facilitate the work we early divided the state into four districts and placed a field man full time in each. Those field men came to Columbus on Saturdays for staff meetings, at which time the various problems were discussed.

The field work of most of the 300 such workers was discontinued last September, except in 30 counties where we were collecting data on transportation. When this work was discontinued, a large amount of material was sent to Columbus.

From the beginning we have had as our goal the preparation of a separate report for each county, to be mimeographed for distribution within the county. For that purpose, the headquarters staff, which numbers between 30 and 40, was divided into the following departments: Drafting, Statistical, Stenographic, Report Writing, and Editorial.

A handbook of instructions for those writing reports was prepared. Standard tables were developed and certain sections of materials were standardized for all of the reports. For each report there will be about 35 tables, which means the preparation of more than 3,000 tables. At the present time these are practically all completed and are now being carefully checked against official records in the various departments of the state. In order to reduce the amount of work in the central office, arrangements were made whereby 20 county reports are being done by local and county superintendents as master's theses, these likewise to be mimeographed for distribution within the counties.

Since September the field men have been writing reports. We have also added another man experienced in that type of work, and the State Department of Education since last October has lent us two field men for full-time work. These men are very useful not only in writing reports themselves but also, because of their knowledge of conditions in the state, they are able to offer much help to the other report writers.

From the beginning we have taken the position that the county superintendent, when he speaks freely, knows best what ought to be done in his county. Outline maps were used by the field men to sketch his ideas of reorganization, and these maps have been used in determining the program to be recommended.

Originally we had thought of preparing a typewritten report and

sending it out to the county superintendents and county boards of education for criticism. However, we have abandoned that idea chiefly because of the difficulty of getting these criticisms, but also because of the amount of work involved in revamping the report in accordance with these suggested changes.

Beginning last December, Mr. Dietrich, assistant director of education, who is in charge of the reorganization program, has been calling in county boards of education and county superintendents to consider the tentative programs we have prepared. These conferences, which last from two to three hours, are attended generally by Mr. Dietrich and at least one other member of the State Department of Education, as well as by members of our own staff. As a part of the material prepared for these conferences, we show how the county compares with the standards set up for reorganization in Ohio. These standards, I should add, were adopted from the ones suggested by the United States Office of Education. This comparison gives the county board and county superintendents an overview of the situation in the county. Following this, we take up each specific change which we think should be made. After agreements are reached, a memorandum is dictated during the conference so that a record is available. Copies of these memoranda are then sent by Mr. Dietrich to the county superintendent and county board of education for checking to see if they are in accord with the agreements reached. At the present time, 87 of the 88 county superintendents and county boards of education have been called in for such conferences.

It is my opinion, shared, I think, by all who have participated, that these conferences are the most significant part of the study. A number of county superintendents expect to ask their county boards to adopt the plan agreed upon as the official plan of the county, working it out as rapidly as possible. Others are confident that by 1938 they will have completed the reorganization program agreed upon in the conferences. Although there are some who will do very little, I think all will take some steps toward a reorganization plan as required in the Foundation Program.

As already noted, 171 of the 176 maps of the state have been secured, and all of them have been put on tracings and planographed. Also, all of the county conferences excepting one have been held. Our problem now is to get the reports, each of which will be about 100 pages in length, written, stenciled, mimeographed, and assembled. At the present time, approximately two-thirds of the report writing is done, and about one-fourth of the mimeographing. According to our estimates, about 8,000 stencils will be required and a million sheets of paper. The mere job of reproducing the reports after they have been written is then a tremendous one. Our staff is now so organized that we can turn out about five county reports a week. We hope to be able to complete the entire job by July 1, the date of expiration of the grant for the project.

In addition to the individual county reports for distribution within the counties, provision has been made in the budget for the printing of a state report which will include materials on a state-wide basis.

There will also be included in it the procedures followed in setting up and making these county studies. This report should prove very valuable in showing the trends of public education in Ohio during the last thirty years.

Personally, I am tremendously enthusiastic about the influence of this study on school districting in Ohio. Much use has already been made of our recommendations in the proposed reorganization programs as required by law for 1937. Next year, with county board elections over, a more extended program should result. Whatever results are obtained will be largely due to the excellent coöperation given by the United States Office of Education, the State Department of Education, the county superintendents, the county boards of education, and, last but not least, the WPA state and district offices. Their efforts to assign to this project the best qualified people have been most commendable. These combined efforts, we believe, will make a significant contribution in carrying out the provisions of the Foundation Program Law which requires a reorganization program "which will provide a more efficient and economical system of county schools."

Report on NYA School Aid Activities for 1936-1937

QUENTIN D. WERT, Supervisor of High School Aid, NYA

THE National Youth Administration of Indiana considers it a pleasure and a privilege to have this opportunity to express to the school men and women of Indiana its sincere appreciation for the remarkable coöperation on the school aid program. This has been shown through your promptness in replying to all communications, the carefulness with which you have prepared payrolls, the quick response to our recent questionnaire, and the attendance at the various meetings. It is this friendly and interested coöperation which has made Indiana outstanding in the field of school aid. You have made the NYA school aid program. The national office of NYA sends its greetings and concurs with the state office in expressing thanks. Personally, I consider it a distinct pleasure to have the privilege of appearing on this program which deals with educational measurements.

At an educational meeting, a brief review of the philosophy underlying the NYA program as it has been built up in Indiana probably will be quite appropriate. The various ideas contained in this statement of the philosophy underlying the NYA are those which have been expressed through the words and actions of the school people of Indiana. Here is a program whereby the needy and deserving youth of Indiana may be assisted in continuing their education. We want them at all times to be engaged in work which is educational and socially desirable. But no matter what sort of work they are doing, however glorious or menial the task, they must realize above all that any honest work is respected. A double advantage accrues when work can be both useful and educational to the high school boy or girl. Loafers have no place on a program of work sponsored by an educational institution.

We know that some boys and girls cannot do a high quality of work either with their hands or in the school room. These boys and girls are with us; we have them as an educational problem, as a social problem, and as an economic problem. If we can do something with them through work and education in the school, we will have less bother concerning their welfare after they leave educational institutions. Perhaps we have an opportunity through the program to do real jobs of character education indirectly by pointing out the necessity for reliability, trustworthiness, and accuracy. The NYA has always encouraged good grades and regular attendance as part of the qualifications for this program; but, as I said above, school people must retain a tolerance toward those boys and girls who seemingly have a low I.Q. We have to educate them, and if we don't educate them in good work habits we have failed all along the line.

Now that schools are about to close for the current term I think that you should again be reminded of the project phase of the NYA

program. The Project Division of the NYA employs any boy or girl, 18 to 25 years of age, who is a member of a family receiving any sort of public assistance. These youth work on all sorts of projects. If you have some work in mind for which these youth might qualify, please write to the National Youth Administration, 308 West Ohio Street, Indianapolis.

A great amount of time could be consumed by quoting the statistics of the school aid program for the current year. Only a few pertinent figures will be presented, however. Since the continuance of the NYA program for the current school year was not announced until late, there were only 455 schools which submitted payrolls during the first month of this school year. These 455 schools gave employment to 4,396 students, who earned an average of $3.48 each. The rapid spread of the program is indicated in the participation of 610 schools by the second month with an employment figure of 5,811 and average earning of $4.35 per youth. During the sixth month (the latest month upon which there are complete figures) there were 658 schools submitting payrolls with participation of 6,747 boys and girls whose average earnings were $4.68.

Just a word on the college aid program. In the 38 colleges and universities in Indiana participating in the NYA college aid program, there are 3,700 youths employed. These college students earn up to an average of $15 per month with a maximum of $20 in any one month. They are employed on projects similar in nature to those you operate in your schools.

A study made from the project description reports which you submitted showed 28 distinct fields of work in which boys and girls have been employed. Of course, there are hundreds of variations of employment under these 28 large divisions. For example, under the division of Library Assistants, there are enumerated such fields of employment as acting as custodian; cataloging books and magazines; labeling; varnishing and refinishing books; mending books and magazines; classification of teaching, debate, and essay materials; distributing and receiving books; shelving and dusting books; assisting in the public library; and compiling special clippings of all descriptions.

Some other divisions found in the above-mentioned 28 fields are assisting in the athletic, health, and physical education departments; assisting in the home economics department; assisting in the science, commercial, and industrial art departments; serving as clerks to teachers; beautifying the school grounds; and so on. Of the 663 requests for project descriptions from that many schools, 634 or 95.6 per cent have been returned. This again shows the almost complete coöperation of the school people in Indiana.

The schools have been given an almost free range in the development of projects upon which their youth might work. The stipulations of the NYA that these projects must be socially desirable and that student workers must not displace anyone ordinarily employed from public funds have been practically the only restrictions issued by NYA. We sent out a list in *High School Aid Bulletin No. 22* of suggested projects for the convenience of those who were having difficulty mapping

a program; but this list was merely one of convenience and any other project ideas which may have developed in the community and which seemed to be educationally sound to the school people were acceptable to the NYA. Seed-corn testing projects which are in operation in many communities at this time are very worth-while. In many schools, materials and instructions have been supplied for the repair of books in the library. Such projects as these have not only made it possible to repair the books of the school, but have contributed materially to the work education of these boys and girls assisting in the project. Many schools have made small objects, such as metal and wooden filing cases, in which such things as soils, government pamphlets, and music scores have been placed. One small city instituted the project of compiling a city directory for the service club of that city. Other schools have had projects whereby overworked elementary teachers have been assisted by some senior boy or girl who had ambitions to be a teacher. Of course, we may say that assistance to these teachers is properly the responsibility of the local community and not of the federal government, but it is difficult to get a local community to employ cadet teachers. In many schools throughout the state, school-ground beautification projects are being conducted. I might go on indefinitely in enumerating the many worth-while projects which you people are conducting. It seems to us that the school people of Indiana have realized their opportunity in having a work-study educational program.

Through the employment of boys and girls on the NYA program in your school, you have, no doubt, seen the results of some of the education to which they have been subjected. How have they measured up to your expectations as workers? Have their courses in bookkeeping and typing enabled them to make out a payroll? How well are these youths instilled with the idea of giving honest work for the dollar? How willing are they to accept direction and responsibility? Do boys and girls working on NYA in your school realize the part they play now and should play in the future in the life of their communities? Let us reflect a bit. Is not this work-study program which you are operating a beautiful opportunity to do some practical measuring not only of each boy and girl but also of the effectiveness of the school program?

You are no doubt wondering about the continuance of the NYA school aid program for the school year 1937-38. I have no definite information for you; but I will say that, if I were a school administrator and desired to use NYA, I would make now all preliminary arrangements for next year.

Some Experiments in Teaching German Vocabulary

E. O. Wooley, Assistant Professor of German,
Indiana University

In recent years the reading objective has been generally accepted as the chief goal of foreign language instruction. While no teacher has made a complete analysis of the process of learning to read a foreign language, most teachers would include among the factors of the problem, the acquisition of vocabulary, the learning of idioms, the immediate recognition of the force of grammatical forms, and, in German, the ability to grasp at once the intricacies of word order. Of the four factors, the first, the acquiring of new words, seems to be the most tangible, hence it has received more attention than the others, and in it more progress has been made. While it is quite difficult to agree on the active vocabulary needed for speaking a foreign language, it is a far easier matter to base the passive vocabulary required in reading on the texts to be read. As an eminent authority, Michael West, stated in a recent paper on vocabulary: "As a guide in selection of a reading vocabulary the word-frequency list is unassailable; for obviously that word which is most frequently met in reading material is the most valuable word for one to learn to read."

A brief account of the attempts made in the past few years to establish such a vocabulary is in order at this point in our discussion. In 1923 Professor Walter Wadepuhl made a study of the vocabulary of 20 elementary German grammars. The Chicago Modern Language Teachers Association became interested in Wadepuhl's study and appointed a committee under the chairmanship of Professor B. Q. Morgan to study the problem further. The committee compared Wadepuhl's list with the frequency wordbook prepared for stenographers in 1898 by Kaeding; it was a tabulation of over 10,000,000 running words. In 1924 the Chicago Modern Language Teachers Association adopted the revision of the Wadepuhl vocabulary, which was published in the *Modern Language Journal*, April, 1925. The list contained about 1,200 words. In 1931 Professor C. P. Purin published *A Standard German Vocabulary of 2,000 Words and Idioms*, based on the frequency of words in a dozen texts. In December of the same year the American Association of Teachers of German appointed a committee with Professor Morgan as chairman to study the question of a minimum standard vocabulary and to bring in a report. In December, 1933, the committee submitted a list of words based entirely on Kaeding's wordbook. It was adopted as the official list of the American Association of Teachers of German and was published in 1934 with the title *Minimum Standard German Vocabulary*. It is in the form of a dictionary with English equivalents. The list contains about 2,150 basic stems, with enough compounds and derivatives to raise the total to 4,810 words. The list suffers from two weaknesses: (1) the combination of basic words with derivatives makes

the list inconvenient for practical use; (2) the Kaeding wordbook was based on reading material that is foreign to ordinary school work, such as parliamentary and military law and commerce.

The writer became interested in the problem of vocabulary study when he was enrolled in Dean H. L. Smith's course in Educational Measurements in the summer of 1922. As a term paper he submitted a tabulation of the vocabularies of 10 French texts. When the Chicago vocabulary appeared, he thought that its basis on 20 grammars was too narrow, that it took no account of reading texts. Accordingly he prepared a list of 600 German words based on the tabulation of the vocabularies of 20 grammars, 20 prepared readers, and 20 elementary texts. He used this list in rewriting the text of *Geschichten und Märchen*, which D. C. Heath and Company published in 1929. With a feeling that the previous study failed to include advanced reading, the writer began in 1930 to tabulate the vocabularies of 100 German textbooks: 25 grammars, 25 prepared readers, 25 elementary texts, and 25 advanced texts. Perhaps at this point there is need of a word of defense for tabulation of vocabularies rather than of the running words of texts. The latter is a little more accurate, for it gives a wider spread of frequency. The more common words occur thousands of times, whereas the maximum number of occurrences in 100 vocabularies is 100. The advantage of the wide spread, however, applies to comparatively few words. The tabulation of vocabularies proceeds much faster than that of running words; the individual investigator could not find time to tabulate running words by the million. While some vocabulary makers purposely omit the most common words, these are easily restored by the investigator.

The tabulation of the 100 vocabularies produced a list of approximately 40,000 words with a frequency range of from 1 to 100. The usual procedure with such lists is to select the 2,000 words most frequently used. The resultant list always shows the peculiarities of the reading on which it is based. To eliminate this bias, it is necessary to compare one list with others. The writer checked his first 2,000 words with three other lists and rejected some words found in no other list. After he had established the final list of 2,000 words, he supplied each word with its most typical English meanings. Under the careful editing of Professor B. J. Vos, of the German department of Indiana University, the work appeared in mimeographed form in 1935 with the title, "A Standard German Vocabulary of 2,000 Words." The price (30 cents) is nominal as compared with the Purin list ($1) or the Federation list (90 cents). Some hundreds of copies have been sold to students, who generally report them as helpful. The writer usually suggests to his own students who use the list to check the known words at frequent intervals; if they wish to memorize the list, it is well to wait till near the end of the year when most of the words have been learned previously in context.

Most investigators retain the 2,000 words sought for and reject the rest of the tabulation. However, it runs counter to the writer's sense of economy to utilize merely the central core of the 40,000 words and to waste the remaining 95 per cent of the study. In order to give to the infrequently used words their due, the writer analyzed the entire 40,000

words into approximately 2,350 word families, placing each derivative and each part of every compound in its appropriate group. Since each word carries with it a frequency of from 1 to 100, the total of these frequencies establishes the importance of each family. Thus it is possible to present to a class the most important word families with the most frequently used derivatives and compounds under each. In a study of derivation the most commonly used derivatives can be offered as examples rather than any random example that comes to mind. These word studies were used to advantage last year in the preparation of exercises for another D. C. Heath text, *Graded German Readings*.

The next phase of the problem related to the construction of tests and the establishment of norms of achievement. The writer placed the 10,000 most frequently used words of the 40,000 in a book of 100 pages with 100 words to the page. To construct a test, it is necessary only to select any word from the first page, then every hundredth word thereafter. By the same method 99 alternative tests may be constructed, to prevent the students from gaining familiarity with a single test too frequently used. Of course, as the writer told the freshmen recently, the results of the tests would be invalidated if some enterprising freshman should gain access to the master list and memorize the entire 10,000 words. Since the tests rest on a scientific sampling of words, it seems safe to assume that a student knows, of the 10,000 words, 100 for each familiar word in the test; thus a score of 20 indicates a knowledge of 2,000 words. Freshmen who have made no study of words score 27 as a median at the end of the year, sophomores similarly a median of 39.

At first thought one is surprised that beginners should achieve a score of 27, to which is added only 12 points by the sophomores, who read several times as many pages as the freshmen. While the writer is not absolutely sure of the explanation, he can suggest certain advantages enjoyed by the freshmen: (1) they get the benefit of cognate English words; (2) in their reading they encounter nearly all the common prefixes and suffixes of nouns, adjectives, and verbs; (3) a partial checking of the 2,350 word families against the vocabularies of the freshmen texts and those of the sophomore texts used in the writer's classes indicates that freshmen meet 55 per cent of the word families and that sophomores meet only an additional 10 per cent. The same advantage in the freshmen's favor is shown in the median scores of the American Council Alpha Vocabulary Tests. For the freshman year the scores are: first semester 26, second semester 37; for the sophomore year, first semester 38, second semester 46. We observe the gain of merely one point from 37 to 38, and are not surprised then that the writer's class in German methods decided that, on the strength of the American Council tests, the first semester of sophomore reading might as well be omitted altogether, since it made almost no contribution to the student's stock of words.

Occasionally a touch of humor creeps into as serious a study as that of learning German vocables. At the beginning of the summer term a few years ago, the writer, pressed for time on the first day, asked the students of second-year reading to test themselves at home.

One man, who had made a C grade in freshman work and had been out of school for three years, produced a score of 50. The writer did not express his surprise, but praised the unusual score. At the end of the course in a supervised test the same man scored 25. The writer then explained to the class how under his instruction one student had lost half of his vocabulary in one summer; another summer of such instruction would make him innocent of all German. This instance of cheating is the only one the writer has observed. Generally the students are glad to measure the increase in their vocabulary and they know that their semester standing is unaffected by their vocabulary scores.

We assumed above that a student knows 100 words for each point of his score in the vocabulary test. The writer tested the validity of the assumption in an experiment which he reported in the *Modern Language Journal* for October, 1932. He wished a more definite check on the size of the passive vocabulary which a freshman can acquire in one year, and made an extensive test of one student's vocabulary. The student who submitted to the test was a sophomore in university standing, who began the freshman work in German without previous contact with the language in home or school. She was a student of outstanding ability, regularly making A in all subjects and scoring, on the American Council Alpha German Test, 72 in vocabulary and 43 in grammar at the end of the year. These scores represent percentile ranks of 98 and 99 respectively. In the course of the year she read 400 pages of easy German and studied intensively Purin's *A Standard German Vocabulary of 2,000 Words and Idioms.* Attention was called in class to the common rules of word formation.

The writer divided his list of 40,000 words into two lists, the 15,000 more common words, the 25,000 less common words. The student was given the list of the 15,000 more frequently used words, with instruction to write the English equivalents of as many as possible and not to spend more than 20 minutes on any 100 words. The student did the work in the summer without supervision, but there was no reason for, or evidence of, dishonesty in the test. The score on the test per 1,000 was as follows:

(1)	978	(4)	681	(7)	609	(10)	617	(13)	621
(2)	889	(5)	626	(8)	607	(11)	617	(14)	604
(3)	794	(6)	631	(9)	604	(12)	583	(15)	554

Total 10,015

The writer drew the following conclusions from the experiment:

1. The score on the first 10,000 words was about 7,000, whereas the student had scored 61 on a test of 100 words. It would seem that a student's knowledge of vocabulary would be greater than 100 times the score on 100 words.

2. The score of 10,015 words did not exhaust the student's vocabulary. Two smaller tests were also given. On a sampling of 200 words, spread evenly over the list of 25,000 less frequently used words, the score was 94. A further test of 850 words, which represented every hundredth word in Brandt's German-English dictionary, produced a score of 307. It seems safe to assume also that the disconnected words

of a vocabulary are harder to translate than the same words in context.

3. The results of the test must be greatly discounted, because: in the first place, a list of words derived from the vocabularies of texts contains many self-evident derivatives, compounds, and cognates; and, in the second place, the student was given credit for translating compound words literally, whereas many figurative and idiomatic meanings were unknown to the student.

4. After the first 4,000 words the student arrived on a plateau which apparently had no limit. The reason for this plateau was that each thousand words produced about the same number of self-evident compounds. It would seem, then, that to make a test valid beyond the 4,000 words, many easy compounds and derivatives would have to be removed.

5. The score of 10,015 words cannot be considered a norm for freshmen, because only industrious students of high linguistic ability will equal it.

6. The study confirms the well-known fact that a student's vocabulary grows rapidly if he learns to apply the rules of word formation systematically.

When Indiana University adopted the proficiency reading tests in foreign languages about five years ago, an interesting correlation soon became evident between efficiency in reading and the scores on the writer's vocabulary tests. Students with a score of 40 or more (4,000 words) regularly pass the reading test; students with 35 or less regularly fail. Between the two scores there is a "no man's land," in which careful students pass, careless students fail. From vocabulary scores the writer has been able to predict with a small percentage of error a student's chance of passing the reading test. This prognostic character of the vocabulary tests makes them of considerable interest to the students. A low score is the signal for increased activity in acquiring vocabulary; a high score adds confidence in approaching the proficiency reading tests.

The writer observed another correlation that proved interesting. About two years ago a faculty committee of Indiana University, composed of non-language instructors, studied the language records of students who had passed the reading tests. The committee reported that on the average 17½ hours in a foreign language prepares the student to pass the tests. Now the freshman course in language includes ten hours and the sophomore course, if taken in full, an additional ten hours. Seventeen and one-half hours represents the freshman year and three-fourths of the sophomore year. If we recall the median achievements in vocabulary tests of the two years (freshman, 27, and sophomore, 39), we note that the gain in the sophomore year is 12 points. Three-fourths of this achievement is 9 points, which when added to 27 makes 36, the score at which students begin to pass the reading test. Here we seem to be dealing with an exact correlation.

In the past two years the writer has conducted experiments to determine to what extent a freshman's reading vocabulary can be in-

creased by study. At each lesson of the freshman class in 1935-36 the writer presented about 20 words occurring in his study of the 100 vocabularies. Emphasis was placed on derivation, compounding, synonyms, antonyms, and cognates. An effective phase of the experiment was the rapid learning of new words in context. Before the recitation the writer placed on the blackboard the new words of a story with English equivalents. As the writer read aloud to the class, the students set the new words into the story with practically no interruption of the thought. Since they had no printed text before them, they were compelled to follow the reading through the natural channel of the ear and at a normal rate. Two or three pages a day of this reading aloud increased greatly the students' vocabulary and their power of comprehension. To stimulate the class, the writer gave vocabulary tests every month with prizes for the greatest progress over the preceding month. Lest anyone should charge the writer with corrupting the youth of the state with the low incentive of gain, he hastens to state that the prizes were some textbooks he had published; clearly the value was too slight to stimulate the hope of gain. The median scores of the class by months were as follows: October, 10; November, 17; December, 26; January, 28; February, 34; March, 33; April, 45; May, 42. By the end of the first semester the median score had reached the norm of freshmen for the entire year; in April and May the score equaled that of the sophomores. In fact, 8 of the 24 freshmen passed the proficiency reading test. In order to determine whether emphasis on vocabulary had crippled the achievement in grammar, in May the writer gave the class the American Council Alpha Test in grammar. It was demonstrated that the extra interest in vocabulary had stimulated a like interest in grammar; the class reached the sophomore median. These results, however, were due in large part to the superior mental ability of the students, of whom several were made members of the freshman honor societies.

In the experiment of the present year the writer is making only one change from the normal procedure. He is stressing word study to find out how large a reading vocabulary a freshman can acquire without doing extra reading. The process is not exactly pedagogical, for there is little value in knowing a large number of words that are put to no use. Still the experiment has some justification, for only by isolating the vocabulary problem can we find its limitations and its possibilities. The writer is presenting to the class not less than 100 words a day. The total to date exceeds 10,000 words. In the first few days of school the German words presented had exact English equivalents. These were followed by 2,000 German words cognate with English. After a few weeks the words presented were related to those found in the grammar. The words are all taken from the list of 40,000 on the principle that only words are submitted that can be associated with English or familiar German words. The writer admits that the process leaves many word families untouched, yet he can scarcely be accused on that account of a lack of zeal in the cause of bigger and better vocabularies. The present class was tested on the first day of school with a score of 5, which represents 500 words cognate with English. The median scores have been as follows: October, 14; November, 25; December, 28; January, 30;

February, 31; March, 33; April, 37; May, 50.5. The last score is higher than the May score of last year. The present class seems to have learned more words without extra reading than the other class learned with it.

What part of this study remains incomplete? (1) There is need of organizing the 40,000 words so far as possible around the basic list of 2,000. (2) The tests should be refined, made objective, and standardized. (3) A class should be taught in which vocabulary study is stressed to the utmost, in which the teacher reads aloud, and in which the students read intensively in class and extensively outside of class. By such effort in all these phases of the problem will the students be stimulated to demonstrate to the full their ability to acquire foreign language vocabulary.

Some Trends in Educational Measurement

WALTER S. MONROE,
Director of Educational Research,
University of Illinois

THE written examination as a means of determining promotion, admission to secondary schools and colleges, and graduation was introduced into the United States about the middle of the nineteenth century.[1] It was strongly endorsed by Horace Mann[2] in 1845. About 1880 criticisms of written examinations began to appear and a report[3] in 1891 states that their use as a means of determining promotion had been modified or abolished in many schools. On the other hand, the establishment of the College Entrance Examination Board was being promoted and the first examination was given in June, 1900.[4]

Until after 1900, criticisms of written examinations and their defense were based upon opinion. In 1905 Cattell[5] urged the "scientific study" of written examinations and a year later Thorndike[6] reported a study showing the inefficiency of entrance examinations as a means of selecting students for admission to college. Numerous studies of written examinations were reported during the following years. The three studies of the reliability of marking examination papers by Starch and Elliott[7] in 1912-13 and the more comprehensive study by Kelly[8] in 1914 were very influential in creating a widespread conviction that written examinations of the essay type are very unsatisfactory instruments for measuring school achievement. Some asserted that essay examinations had been proved to be worthless as measuring instruments.

This trend was augmented by the publication of objective tests. Among those that might be mentioned are the Courtis Standard Research Tests in Arithmetic, Woody's Arithmetic Scales, Kansas Silent Reading Test by Kelly, Thorndike Reading Scales, and Van Wagenen History Scales. Since these tests were objective, unreliability in the marking of the papers was eliminated.

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[1]Kandel, I. L. *Examinations and Their Substitutes in the United States.* The Carnegie Foundation for the Advancement of Teaching Bulletin, No. 28, pp. 22-7. The Carnegie Foundation for the Advancement of Teaching, New York City, 1936.

[2]Caldwell, O. W., and Courtis, S. A. *Then and Now in Education, 1845-1923.* World Book Company, Yonkers, N. Y., 1924, pp. 238 f.

[3]White, E. E. *Promotions and Examinations in Graded Schools.* U. S. Bureau of Education Circular of Information, No. 7, p. 14. Government Printing Office, Washington, D.C., 1891.

[4]Farrand, Wilson. "The College Entrance Examining Board." *School and Society* 22:601-7, November 14, 1925.

[5]Cattell, J. McKeen. "Examinations, Grades, and Credits." *Popular Science Monthly* 66:367-78, February, 1905.

[6]Thorndike, E. L. "The Future of the College Entrance Examination Board." *Educational Review* 31:470-9, May, 1906. Also "An Empirical Study of College Entrance Examinations." *Science* 23:839-45, June 1, 1906.

[7]Starch, D., and Elliott, E. C. "Reliability of the Grading of High School Work in English." *School Review* 20:442-57, September, 1912.

Starch, D., and Elliott, E. C. "Reliability of Grading Work in Mathematics." *School Review* 21:254-9, April, 1913.

Starch, D., and Elliott, E. C. "The Reliability of Grading Work in History." *School Review* 21:676-81, December, 1913.

[8]Kelly, F. J. *Teachers' Marks, Their Variability and Standardization.* Teachers College, Columbia University, Contributions to Education No. 66, New York, 1914. 139 pp.

Although the year 1920 probably should not be taken as marking the beginning of a new period in the development of educational measurement, it will be helpful to note the status at this time. Examinations of the essay type had been discredited, largely as the result of studies that revealed wide variability in the marks assigned to the same paper by different teachers, but these measuring instruments were still almost universally employed in schools and colleges to measure achievement. Standardized tests, i.e., tests for which norms have been determined, were widely accepted as relatively satisfactory measurements. A considerable number of such tests had been constructed and for a half-dozen years their use in schools had been promoted by bureaus of educational research as well as by the leaders in the testing movement. But the use of these tests was limited, even at the elementary school level. At the high school and college levels few tests were available and they were not widely used.

In the first number of the *Journal of Educational Research*, January, 1920, W. A. McCall published an enthusiastic endorsement of the true-false test which he designated as "a new kind of school examination." He urged that teachers prepare true-false tests for measuring the achievement of their pupils. Additional support was given to this type of test by Gates[9] in 1921. In the same year an experiment[10] was reported at Columbia University in which tests involving several types of objective exercises were employed to measure achievement in the course in "Contemporary Civilization." This experiment was given further publicity by the inclusion of portions of the report in *Measurement in Higher Education* by Ben D. Wood in 1923. *The Improvement of Written Examinations*, by G. M. Ruch, 1924, gave further impetus to the movement and provided illustrations of objective tests prepared by teachers. Other writings might be mentioned, but these are probably sufficient to indicate the extraordinarily rapid acceptance of what today are generally called "new-type examinations." Various types of exercises are employed—true-false, multiple choice, matching, completion, and the like—but all require little or no writing and the scoring is objective, i.e., it is done according to definite rules. Objective tests had been employed by a few teachers before 1920 and many of the types of exercises are to be found in standardized tests constructed between 1910 and 1920, but the general use of new-type examinations did not begin until after 1920.

The year 1920 also marks the beginning of a phenomenal increase in the use of standardized tests. In many schools they were substituted for examinations prepared by the teacher.

The increase in the use of standardized tests and the introduction of new-type examinations prepared by teachers represent a significant trend in the development of educational measurements. This trend involves more than a change in the nature of the measuring instruments used. For a number of years there was a general uncritical acceptance of an objective test as a highly satisfactory measuring instrument, es-

[9]Gates, A. I. "The True-False Test as a Measure of Achievement in College Courses." *Journal of Educational Psychology* 12:276-87, May, 1921.

[10]Coss, J. J. "The Measurement of College Work." *Educational Administration and Supervision* 7:301-34, September, 1921.

pecially if it had the endorsement of someone of reputation. Reliability coefficients, some of them not very high, were accepted as sufficient proof of the merit of tests. When the question of validity was raised, correlations of objective test scores with teachers' estimates or with marks on essay examinations were cited and interpreted as evidence of satisfactory validity, or the argument[11] was advanced that, even if objective tests did measure only factual information, one could not think without facts and hence the relationship between the facts that a student remembered correctly and his other achievements must be sufficiently high to make the scores yielded by objective tests valid measures of "ability to think."

In analyzing this attitude toward objective tests two measurement procedures should be noted. When we measure the distance between two points, the usual procedure is to apply the yardstick or other instrument to this distance. When a given volume of a liquid is to be measured out, the liquid is poured into a graduated container until the height reaches the mark indicating the desired volume. Such measurement may be described as *direct*. The measuring instrument is applied to the thing to be measured. *Indirect measurement*—the measurement of one magnitude as a means of measuring another—is illustrated in the physical world by the usual measurement of temperature. We actually measure the height of a column of mercury or other liquid in the stem of the thermometer but we record the result in terms of degrees of temperature. In this case indirect measurement is satisfactory because (1) within ordinary ranges, the correlation between temperature and the height of the column of liquid in the stem of a thermometer is perfect, and (2) the height corresponding to a given temperature, for example, that at which water freezes, remains fixed.

School achievement, which may be described as ability or tendency to do, is measured through performance—that is, by what the student does under certain conditions. Hence, in a sense, all measurement of school achievement is indirect, but the procedure may be described as direct when the obtained performance represents the functioning of the achievement whose measurement is desired. For example, if it is desired to measure the ability to add columns of figures under certain conditions and the performance is obtained by asking pupils to add typical columns of figures under these conditions, the process of measurement is described as direct. The procedure is described as indirect when the obtained performance represents the functioning of abilities different from those whose measurement is desired. For example, if it is desired to measure the ability to answer thought questions within a given area and the test administered calls for responses to simple factual questions, the obtained performance does not represent the functioning of the ability to answer thought questions even though the facts called for are applied in responding to such questions. Hence, the process of measurement in such a case is designated as indirect.

An achievement test yields direct measures of some ability. If it is desired to measure what the test measures, the process is direct. If

[11]For a typical argument, see Wood, B. D. *Measurement in Higher Education*. World Book Company, Yonkers, N. Y., 1923. pp. 162-3.

it is desired to measure some other ability, the process is indirect. In some cases the difference between what a test measures directly and what it is desired to measure is slight. For example, a spelling test consisting of words to be dictated measures directly the ability to spell the words dictated under the conditions of the administration of the test. If the measure desired is that of the ability to spell the words used in expressing ideas, the difference is probably relatively small and for practical purposes the procedure may be designated as direct. In other words, we may, as a means of convenience, employ direct measurement to designate the process when what the test actually measures differs slightly from what it is desired to measure, and we may then reserve the term "indirect measurement" for those cases in which the difference between what the test measures directly and what it is desider to measure is marked.

When the measurement is direct, a test whose reliability is high is also highly valid. When the measurement is indirect, the validity of a test is likely to be materially less than its reliability. Hence, it is important to identify the types of achievement which may be measured directly by means of objective tests and the types of achievement which cannot be measured directly by such instruments. In the test and measurement volume of the *Report of the Commission on the Social Studies*, seven "types of abilities" are listed (pp. 107-8) as being included in the immediate objectives of this field.

1. Skills.
2. Information (memorized facts).
3. Ideas represented by vocabulary and definitions.
4. "Ability to apply ideas to new situations."
5. Interests.
6. Attitudes.
7. "Ability to express social learning and understanding clearly and effectively."

A. C. Krey, the author of this chapter, points out that new-type examinations are relatively satisfactory for measuring information and ideas, somewhat less satisfactory for measuring skills, only partially satisfactory for measuring "ability to apply ideas to new situations," and not at all satisfactory for measuring interests, attitudes, and "ability to express social learning and understanding clearly and effectively." Although he does not employ the terms "direct measurement" and "indirect measurement," his argument might be expressed with these phrases. New-type examinations yield relatively direct measures of information and ideas but when these instruments are used to measure "ability to apply ideas to new situations," interests, attitudes, and "ability to express social learning and understanding clearly and effectively," the process is so indirect that the results are likely to be distinctly unsatisfactory.

Krey's conclusion relative to the validity of objective tests for measuring achievement other than skills, ideas represented by vocabulary and definitions, and information stands out in striking opposition to the position taken by the proponents of objective tests ten to fifteen years

ago. His conclusions, however, are in agreement with several recent statements. For example, in his recent volume *Education as Cultivation of the Higher Mental Processes*, C. H. Judd, after quoting the argument advanced by Ben D. Wood in 1923, points out the fallacies in Wood's statement. Furthermore, it is now clear that the experimental evidence does not support the contention that the scores yielded by objective tests are valid measures of "ability to apply ideas to new situations." A study by R. W. Tyler, reported in the volume by Judd, gives correlations between "scores on tests requiring recall of information and scores on tests requiring both recall and application of principles" ranging from .22 to .45 (p. 12). Obviously such correlations are too low to justify the conclusion that a test requiring recall of information is a valid instrument for measuring ability to think. Even the higher coefficients of correlation reported by some investigators do not support the position maintained by the proponents of objective tests a few years ago.

It should also be noted that the correlation between what a new-type examination measures directly and ability to think is not stable. It will be materially decreased by the exclusive use of new-type examinations. Students will direct their efforts toward the goals that are implied by the tests administered to them. There has been much discussion of the importance of teachers formulating their objectives and, in response to the pressure of authority, they have spent many hours in formulating lists of immediate objectives, that is, the goals toward which students are expected to direct their efforts. Many of these lists merit commendation, but their influence upon students is practically nil in comparison with the influence of the tests administered. Students direct their efforts toward becoming able to respond to the tests they anticipate. This is only natural and we are deluding ourselves if we expect anything else. Hence, if the correlation between the scores on a new-type examination and "ability to apply ideas to new situations" is as high as .65 when this type of examination is first administered to a group, repeated administration will cause the students to direct their efforts toward becoming able to respond to such tests, and we may expect a decreasing degree of correlation. This means that as new-type examinations are employed in a class they will yield less and less valid measures of "ability to apply ideas in new situations" and other controls of conduct that they do not measure directly.

The uncritical acceptance of objective tests, both standardized tests and new-type examinations, on the basis of high reliability, which implies implicit faith in indirect measurement, is beginning to be replaced by a distrust of indirect measurement and an attempt to make the measurement of achievement direct. The conclusions of Krey and of Judd which have already been noted indicate this trend. It is also indicated in the recent volume, *Achievement Examinations*, prepared under the auspices of the American Council on Education. In the introductory chapter R. W. Tyler says: "A satisfactory examination must . . . provide evidence of the degree to which students are reaching each of these important objectives. . . . An essential step in planning an examination program is to formulate in a clear and understandable fashion the important objectives which the instructor is trying to reach."

In the same volume E. F. Lindquist points out that the problem of determining what to measure, which is essentially one of "curriculum construction," "is fundamental to adequate test construction." He says also that "perhaps the most serious of the weaknesses which characterize achievement tests now being constructed are basically weaknesses of the curriculum rather than of the test techniques themselves." When the nature of "ability to apply ideas to new situations," interests, attitudes, and "ability to express social learning and understanding clearly and effectively" is recognized, it is apparent that direct measurement cannot be accomplished by new-type examinations. There is need for examinations of the essay type and for other measurement procedures. The trend is not back to the exclusive use of essay examinations and other tests which characterized educational practice twenty-five years ago. New-type examinations have a place in the measurement program but so do essay examinations and probably even procedures of evaluation or estimate. The fundamental principle which is beginning to be recognized and which will doubtless be generally accepted is that the type of achievement to be measured should be noted and a type of measuring instrument or procedure should be selected which will provide as direct measures of each of these abilities as is feasible. This trend which doubtless will be increasingly apparent is, in my judgment, in the right direction. It is to be hoped that this trend, which is a reaction from the extreme position of ten to fifteen years ago, will not develop into another extreme position.

Accompanying the development of objective tests, there was a movement to establish standard scores to be used as norms in interpreting both individual scores and class and school averages. This movement encountered strong opposition from those who were skeptical concerning the possibility of measuring satisfactorily the results of instruction by means of a test whose administration occupied only a few minutes and from those who were hostile to influences that would contribute to the standardization of our schools. The controversy relative to standardization raged for a number of years. The final stand of the opposition was made at a meeting of the National Council of Education in 1915. The program was planned "to give full hearing to those who are skeptical about the desirability of standardization, tests, measurements, and other exact forms of evaluating school work." But the arguments advanced against standardization were not effective and thereafter little was heard from the opposition.

For a decade or more following 1915 the desirability of standardized tests was generally accepted. A large number of standardized tests have been constructed and since about 1920 their use has been very widespread. The initiation of state-wide testing programs which have flourished in certain states may be regarded as a phase of this trend because the school averages are compared with each other and with the state average. Within the past few years an opposition to state-wide testing programs has appeared. The arguments advanced are very similar to those made by the opponents of standardized tests twenty-five years ago. Probably we shall not go so far as to discredit standardized

tests, but it is likely that our thinking will be modified by the recognition of two basic principles: (1) the tests administered set the goals toward which students direct their efforts; and (2) teachers, except those of unusual independence and confidence in their own ideas, may be expected to direct their instruction so that their students will be prepared for the tests which they are asked to administer. The second of these principles implies that students can be coached for tests of a given type. There is adequate evidence to support this implication.

Recognition of these principles means that when comparisons are made with the records of other groups, the comparison is really only with reference to the objectives implied by the test. A school whose average score is below the state average or established norm is not necessarily an inferior school. It may be that the instruction has been directed toward different objectives and this may have been wise. When the average of a school or a class is high, it does not follow that the instruction has been highly efficient. It may be that emphasis has been placed on instruction that functioned as coaching for the test. Such a practice may have been unwise. As these possibilities are recognized, mechanical comparisons of class and school averages with norms will be minimized, and the objectives toward which instruction is being directed will receive more attention in interpreting test scores.

Until after 1910, the measurement of achievement was almost exclusively for two purposes: (1) determination of grades in courses, and (2) admission to college. Rice, Cornman, Stone, Courtis, and others measured achievement in studying certain problems, but this use was very limited. Some teachers measured achievement as a means of diagnosis, but this use also was a minor one. Tests and examinations are still widely used to determine marks in courses. The change in this connection has been primarily in the nature of the measuring instruments. Entrance examinations are still given by colleges and universities and by the College Entrance Examination Board and other agencies, but the proportion of students admitted by examination has materially decreased. The most significant trend, however, has been in the development of new uses of educational measurements.

Shortly after 1910 it became fashionable to administer tests as a means of ascertaining the efficiency of a school or a school system. A school survey was not considered complete unless it included a testing program. This use of tests is also reflected in comparisons of median scores of a school with the norms of a test or with the median scores of other schools included in a coöperative testing program. Although it is generally recognized today that the efficiency of a school cannot be determined by such a mechanical procedure, the popularity of state-wide programs and other coöperative testing indicates that this use of achievement testing is still an important one.

The use of standardized tests as a means of determining the efficiency of a school was extended by some administrators and supervisors to the determination of the efficiency of individual teachers. Fortunately, this practice never became general and, although the results of tests are doubtless still studied by administrators and supervisors

when teachers are being rated, the use of educational measurements for this purpose may be regarded as incidental.

The use of tests and examinations as instructional instruments which existed in a very minor degree in 1910 has become very prominent. Diagnostic tests are primarily instructional instruments, and any test administered before the end of the semester or year provides the teacher with a survey of the achievement of his students which may be utilized in planning future instruction. Examinations and especially standardized tests set objectives for students.

Although intelligence tests and other prognostic tests are employed in educational guidance, achievement tests provide valuable data for this purpose, and some writers maintain that the guidance function should be made the principal use of measures of achievement. Accumulative records of measures of achievement, especially in terms of percentile scores or other ranks, furnish significant data about students, and numerous guidance or personnel departments are being established, especially in schools having large enrollments. The importance of educational guidance depends upon the position one takes with respect to the function of the school. A number of recent writers have maintained that the guidance use of achievement measures is highly important and will, or at least should, become the dominant use.

Such is the general outline of certain phases of the development of educational measurements during the past thirty years. Time does not permit filling details. The most significant trends appear to be (1) the attack upon and the consequent discrediting of essay examinations, (2) the development of objective tests, and the emphasis upon reliability as the criterion by which measuring instruments were evaluated, and (3) the development of diagnostic and prognostic uses. What of the future? Any attempt to project lines of development into the future is attended with uncertainty. But, if I interpret correctly current educational writings in this field, three trends are indicated: (1) a growing emphasis upon validity and a consequent decreasing emphasis upon reliability as the criterion for evaluating measuring instruments; (2) a decline of the faith in indirect measurement and an increasing emphasis upon direct measurement as a means of attaining satisfactory validity; and (3) a growing respect for essay examinations as instruments for measuring certain outcomes of instruction.

The trend relative to the use of educational measurement is less clearly indicated. The present emphasis upon prognostic measurement and guidance suggests a continuation of this trend, but more adequate recognition of the influence of factors external to an individual may result in minimizing the influence of guidance enthusiasts. I am inclined to think that this will happen, and that measurement for diagnosis and other instructional purposes will become the dominating use.

Constitutional Tax Limitations and Their Influence on Education in Ohio

T. C. HOLY, Professor of Education,
Ohio State University

THIS paper deals with the problem of school support, a topic which vitally affects every phase of school activity, including measurement and supervision. For example, it is estimated that the sale of standardized tests put out by commercial concerns during the depression period was 65 per cent below that of the pre-depression period. Furthermore, during the depression period most, if not all, city and county school systems sharply reduced their supervisory staffs. Any discussion of school support and the factors affecting it, then, has a vital bearing on educational activities.

Before taking up the influence of constitutional tax limitations in Ohio, I would like to review briefly their status in the United States.

Prior to January 1, 1937, nine states had either constitutional or statutory property tax limitations. Of these nine states, Michigan, Nevada, New Mexico, Ohio, Oklahoma, and West Virginia have written these limitations into their constitutions, while Indiana, Rhode Island, and Washington have made these limitations statutory. A variety of substitute taxes have been put on to replace the losses resulting from tax limitations in these states. The most common of these are the retail sales tax and the income tax. However, time does not permit going into detail with respect to the amounts raised in these various states through substitute tax provisions.

Before discussing the Ohio situation, I should like to point out the extent to which the cost of local and state governments has been borne by real property taxes. Until recent years practically this entire cost was thus borne.

In 1930, according to the estimates of the National Industrial Conference Board, $4,614,000,000, or almost 92 per cent of the $5,018,000,000 taxes collected for local governments, came from property taxes. In 1934 it was estimated that about 90 per cent of the money collected for the same purposes came from property taxes. For education alone, school revenues derived from property taxes declined 13.3 per cent between 1930 and 1934. However, within the past decade, and particularly since 1930, real property owners have emphasized the very large sources of income other than tangible property, little of which was reached in defraying the cost of local and state government except in those states having income taxes.

In 1936, thirty states had some form of state personal income taxes, all or part of the revenue derived therefrom being applied to state school support. Furthermore, it has been frequently pointed out that there is no constant ratio between the value of real property and the income derived therefrom. Since it is generally agreed among students in the field of taxation that income is the true measure of ability to

pay taxes, this fact tends to weaken the present practice of taxing real property on the basis of its real market value or some fraction thereof.

So much for the general background of the problem. Now for the experience of Ohio in limiting the real estate taxes for governmental purposes, including education. As early as 1911, Ohio passed a law, known as the Smith One Per Cent Law, which provided that levies on taxable property in excess of ten mills, or one per cent, could not be made without a vote of the electors in the area thus affected. During the World War period, the costs of government increased more rapidly than the value of taxable property, partly due to the increased services given by governmental agencies—a fact, I think, that is generally lost sight of. Recently I saw a state financial report which compared the per-capita cost of government in 1835 with that of 1935, with the implication, at least, that the two figures were strictly comparable. Obviously the governmental services in terms of education, highways, health, police protection, streets, lighting, etc., in 1935 have not the slightest relationship to such services in 1835. In fact, practically none of them even existed at that time. It is my judgment that the sooner we realize that public taxation is the most economical and convenient type of cooperative buying of services useful to groups of people, the sooner we will realize that we get larger returns for our taxes than for any other money we spend.

Despite the fact that governmental cost did increase faster than taxable property in Ohio, the Smith One Per Cent Law remained on the books until 1917 when the tax levy was raised to fifteen mills. This provision continued as a statutory one until 1929 when a constitutional amendment was adopted which did two things: first, it wrote into the constitution the fifteen-mill limitation which had been statutory since 1917; second, it made provision for the classification of property for taxation. Prior to that amendment, the constitution required that all property, except for certain exemptions, should be taxed by uniform rule according to value. This classified property provision was devised to permit the legislature to fix tax rates for the various kinds of personal property other than real property.

Following this amendment, Governor Cooper appointed a committee on taxation to study particularly the intangible field as a basis for legislative enactment of required laws to carry out the classified property amendment. This committee spent several months and got out several volumes of reports. In one of these reports the committee estimated that the amount of intangible property held by Ohio individuals and corporations was 17¼ billions of dollars as compared with taxable real property of 13 billions of dollars.

In accordance with the constitutional amendment, the legislature set up the provisions and rates for taxing this vast amount of intangible property, only a small part of which was then on the tax books. These provisions were enacted in 1931, with the estimates of income derived therefrom based on figures prepared before the beginning of the depression. Such being the case, the income from intangible tax fell far short of expectations. Coupled with that was a reduction in the total state duplicate between 1929 and 1933 from 13 to 8 billions. These two

factors reduced the anticipated revenue for education about 55 per cent. If to this is added delinquent taxes which in some taxing subdivisions amounted to as much as 60 per cent, one gets a picture of the situation in the state in 1933. Schools, municipalities, counties, and other taxing subdivisions were accumulating deficits despite sharp curtailment of services.

In the midst of this situation in 1933 was thrust the problem of another constitutional amendment reducing real estate taxation from fifteen to ten mills. This proposal was sponsored by real estate boards and other organized groups of real property holders who maintained that the intangible tax had not relieved real estate, so they demanded constitutional limitation of ten mills on real property. Opponents of the measure pointed out that government, including education, could not function on ten mills. They admitted in part the justice of the contention of real property holders, but urged that the amendment not be submitted until a proposed program of substitute taxes could be evolved. The proponents of the measure stated that government does not function that way, and that the only way a substitute taxing program could be evolved would be to create an impossible situation which would have to be relieved if government were to function.

There was then submitted to the November, 1933, election a second constitutional amendment, which should: (1) reduce the limitation on property from fifteen to ten mills, which on the basis of the duplicate of that year reduced the revenues for governmental purposes $40,000,000 annually, and (2) authorize old age pensions. This second amendment increased the cost of state government by approximately $18,000,000 per year. It is interesting to note that these two amendments, one sharply limiting sources of income, and the other appreciably increasing state expenditure, were both approved by large majorities.

Since the ten-mill limitation became effective on January 1, 1935, the major problems in Ohio in 1934 and 1935 were to find revenues from other than real property sources to compensate for the losses to local subdivisions resulting from lowered rates, reduced valuations, tax delinquencies, and failure of the intangible tax to produce as expected. Since all local subdivisions were greatly handicapped by this tax limitation amendment, it became a question for the state to decide whether it should select any particular agency to compensate for its operating cost so that some additional margin might be left within the ten-mill limitation for other agencies. There was much discussion about the relative responsibility of the state and education *versus* local government. Out of this came a rather general agreement that the state has a greater responsibility for education than for local government. It is interesting to note in this connection that as late as 1930 the state provided only four per cent of the cost of public education.

Since this group, I take it, is more interested in what happened to the financing of education in Ohio, I shall discuss from this point on two aspects of the problem:

1. Substitute tax measures enacted or continued to offset the limitation on real property.

2. The general state plan for assisting in the financing of public education. Although the plan for so doing was not adopted until after some of the tax measures were enacted, I think I shall discuss it first, giving then a brief digest of the taxes enacted.

The School Foundation Program, as it is called, which is without doubt one of the most significant if not the most significant piece of legislation affecting public education ever enacted in the state, was signed by the Governor on June 12, 1935. It had in general two principles: (1) to compensate for the inability of local districts to support the present school program within the funds available to them; and (2) to compensate in part for differences in ability of the various local districts to support their program of education. The chief provisions of this School Foundation Program are as follows:

A. The minimum operating cost of the Foundation Program as defined by law and expanded in the State Department Bulletin No. 1, entitled *Administration of the State Public School Fund,* is as follows:

   (1) An amount equal to $22.50 for each pupil five years of age or older in A.D.A. (average daily attendance) in a kindergarten school for a term of 180 days.

   (2) An amount equal to $45 for each pupil in A.D.A. in an elementary school (grades 1 to 8, inclusive) for a term of 180 days.

   (3) An amount equal to $67.50 for each pupil in A.D.A. in a high school (grades 9 to 12, inclusive) for a term of 180 days.

   (4) An amount equal to $1,150 for each approved one-room school.

   (5) An amount equal to $2,400 for each approved two-room school.

   (6) For approved high schools having less than 180 pupils in A.D.A. and approved elementary schools having less than 180 pupils in A.D.A. and more than two teachers, such amounts greater per pupil than the $67.50 and the $45.00 respectively as will enable the school to operate at a reasonable level of educational efficiency.

   (7) A foundation program of transportation, in districts where such service is necessary, not to exceed the schedule of such costs as recommended by the Director of Education and approved by the State Controlling Board.

   (8) A foundation program of school tuition equal to the total of the approved budget of such costs for pupils in attendance at the schools of a district other than that in which they reside.

(9) In addition to the foundation program guarantee, each district operating part-time, continuation, and evening schools for a 180-day term is entitled to a distribution equal to $36 for each pupil in A.D.A. in addition to the program guaranteed for the kindergarten, elementary, and high schools maintained by the district.

B. The law provides a flat guarantee for each pupil in A.D.A., based on a 180-day school year, of the following amounts:

Kindergarten pupils	$15.30
Grade 1-8 pupils	30.60
Grade 9-12 pupils	45.90
Part-time, continuation, and evening school pupils	36.00

C. If a local three-mill school levy plus the flat guarantee of $15.30 for kindergarten pupils, $30.60 for grade 1-8 pupils, and $45.90 for grade 9-12 pupils does not equal the foundation program (excluding tuition transportation) as outlined under (*a*), then the state will pay the difference.

D. In order for a school district to participate in additional aid as provided in the foundation program it must meet the following conditions:

(1) Have a three-mill levy for current operating expense.

(2) "No school district shall be entitled to receive additional aid unless the total tax levies of the taxing district of which said school district is a part is at least ten mills for all purposes."

E. Each elementary school and each high school having an A.D.A. of less than 180 pupils must be approved by the State Director of Education and the State Controlling Board in order to participate in the State Public School Fund.

Under the provisions of this program, the state's share during the calendar year of 1936 for the support of the program of education in the state was approximately $49,000,000, which amounts to slightly less than 60 per cent of the total current cost of public education in the state. However, the source of revenue for that purpose lacked about $6,000,000 of meeting that amount. At the present time the legislature is giving consideration to means to offset this shortage. I should add here that in 1935 another constitutional amendment was adopted which further reduces the revenue available for the public school fund. This amendment, likewise adopted by a large majority, exempts food consumed off the premises from the three per cent sales tax.

As a part of the School Foundation Program, there is set up a state public school fund to which were ear-marked certain state taxes. Four of these, which provide the bulk of income for this purpose, are:

1. **Retail Sales Tax.**—In December, 1934, the state enacted a three per cent retail sales tax effective January 1, 1935. The distribution of the income from this tax for the calendar year 1936 is shown below:

ALLOCATION OF GENERAL SALES TAX RECEIPTS FOR THE FISCAL YEAR ENDING DECEMBER 31, 1936*

Purpose	Amount	Per cent of total
Administration	$1,888,509	3.3
Poor relief bonds	4,000,000	7.1
Poor relief (current)	6,000,000	10.6
Public schools	26,882,413	47.4
Local governments	17,921,609	31.6
Total	$56,692,531	100.0

* Taken from the *Preliminary Report of Auditor of State*, 1936.

It will be noted from these figures that public schools receive nearly $27,000,000 from this source. The bill provides that 60 per cent of the net income, after administrative and direct appropriations have been deducted, goes to the public school fund. With the constitutional amendment exempting food, already referred to, it is estimated that the amount derived from this source in 1937 will be reduced about $12,000,000, which, on the 60 per cent basis, would take about $7,000,000 from the public school fund. Efforts are now being made in the legislature to find the additional revenue required to finance this program. However, last fall the platforms of both major parties carried guarantees for adequate and permanent financing for the School Foundation Program. What will happen on this cannot be stated at this time.

2. **Liquid Fuel Tax.**—In 1935, a tax of one cent per gallon was levied on all liquid fuel distributed, used, or sold in the state, the net proceeds of which go into the public school fund. In 1936 this produced between eleven and twelve millions.

3. **The Intangible Tax.**—The rates on this tax have already been discussed, the net income of which, less a few minor reductions, goes into the state public school fund. For 1936 this source furnished between five and six millions for the public school fund.

4. **Cigarette Tax.**—This tax has been in existence for a number of years, formerly having been used as a source of revenue for the State Aid program carried on in the state. Under it a tax of one cent for each ten cigarettes is levied. Although the tax produced between six and seven millions in 1936, over five millions of that amount was needed to meet the obligations incurred before January 1, 1936, by the former State Aid school districts.

The Sales Tax, Liquid Fuel Tax, and Cigarette Tax, when enacted, had expiration clauses of March 1, 1937. However, the Governor of the state called a special session of the legislature in December, 1936, at which time the Sales Tax was extended indefinitely and the Liquid Fuel and Cigarette Taxes re-enacted to expire March 31, 1939. The Intangible Tax earlier enacted has no expiration date. The major problem now, growing out of the limitation on real estate taxation, is to stabilize

sources of revenue in sufficient amounts to meet the requirements of the School Foundation Program. The legislature now in session is giving considerable attention to that problem. The School Foundation Program has been so well received generally that it seems certain adequate provisions for financing it will be made.

In conclusion, it seems fair to say that out of this tax limitation on real estate has come a more satisfactory system of financing public education in Ohio.

Progress Toward a Science of Education

WALTER S. MONROE,
Director of Educational Research,
University of Illinois

THE title will probably suggest to some of you the prior question: Can there be a science of education? This question has been the subject of much controversy but, regardless of the arguments that may be advanced against the possibility of a science of education, the term has been and is widely used, and it will be sufficient for the present purpose to ascertain the meaning associated with it.

The phrase "science of education" was widely used before the beginning of the modern research movement. Its status as a phrase in the pedagogical vocabulary of the period is indicated by its appearance in the titles of books and other writings prior to 1900.[1] When these writings are examined, it becomes apparent that "science of education" was employed to designate rules and principles relating to teaching which had been established primarily by deduction from principles and theories in psychology and philosophy. The complete title of a translation of a volume of Herbart's writings published in 1896 is *The Science of Education, its General Principles, Deduced from its Aim.*[2] In an article entitled "Educational Research," published in 1902, J. M. Rice,[3] who has been called the father of the modern research movement in education, stated that "up to the present time the science of pedagogy has been in its entirety a structure based on no stronger foundations than one of opinions." In other words, before 1900 the term "science of education" was used to designate content that we now commonly refer to as "principles of education" or "philosophy of education."

By means of his studies of the teaching of spelling, begun in 1895, and his subsequent researches in the field of arithmetic and language, Rice directed attention to an inductively developed science of education. From an analysis of the scores obtained by administer-

[1]The following are a few references from the last three decades of the nineteenth century:

Allen, Jerome. "Have We a Science of Education?" *Education* 2:284-9, January, 1882.

Bain, A. *Education as a Science.* D. Appleton and Company, New York, 1878. 453 pp.

Donaldson, James. "Science of Education." *Barnard's American Journal of Education* 26:481-96, July, 1876.

Findlay, J. J. "The Scope of the Science of Education." *Educational Review* 14:236-47, October, 1897.

Ogden, John. *The Science of Education; and Art of Teaching.* (Fifth edition.) Moore, Wilstach, Keys, and Company, Cincinnati, 1860. 478 pp.

Payne, J. "Science of Education." *Barnard's American Journal of Education* 26:465-8, July, 1876.

Payne, W. H. *Contributions to the Science of Education.* American Book Company, New York, 1886. 358 pp.

Royce, Josiah. "Is There a Science of Education?" *Educational Review* 1:15-25, January; 121-32, February, 1891.

Scripture, E. W. "Education as a Science." *Pedagogical Seminary* 2:111-14, January, 1892.

[2]The original publication was in 1806 under the title *Allgemeine Padogogik.*

[3]Rice, J. M. "Educational Research." *Forum* 34:117-30, July, 1902. The article was republished as Chapter I of *Scientific Management in Education.*

ing a test in a number of schools and of information relative to the time devoted to the teaching of spelling and the methods of instruction employed in these schools, Rice arrived at certain conclusions. Although in 1886 W. H. Payne[4] had recognized the possibility of the inductive method having a minor place in the development of a science of education, Rice's study of spelling is generally regarded as marking the beginning of a new concept of a science of education and a new method of its development.

Examination of educational writings of the past twenty years reveals that "science of education" is thought of as designating both a content and a method. For example, in the first chapter of *Introduction to the Scientific Study of Education*, published in 1918, C. H. Judd states (p. 3) that investigations have contributed "a very respectable body of fact" which "can be offered as an optimistic beginning of a science of education." This statement, as well as others similar to it, imply that a "science of education" is to be defined in terms of content, but later (p. 299) Judd observes that "the essence of science is its method of investigation, not its ability to lay down a body of final rules of action." In the first pages of his essay, "The Sources of a Science of Education," John Dewey writes of science in terms of "systematic methods of inquiry." Later he deals with the content of a science of education and points out that it consists not of specific rules or "recipes" prescribing the details of educational practice but rather of laws, principles, and general facts organized into a coherent system.

The scientific method designates more than techniques and instruments for collecting data that are highly objective. It includes the interpretation of the findings resulting from the statistical treatment of the data. Even when the best techniques and instruments are employed, the data collected are seldom without faults. For example, test scores involve errors of measurement and frequently errors of validity. Statistical techniques imply assumptions that are frequently only approximated in the educational data to which they are applied. In many cases it is feasible to study only a sample of the population for which interpretation is desired. In general, research findings are only the best estimates of what is sought. In interpreting such findings, the investigator must maintain a scientific attitude. He must avoid being influenced in his thinking by prejudices or beliefs resulting from casual observation. He must be alert in noting the faults and limitations of his data. He must consider his conclusions tentative until there is adequate verification. Hence, the scientific method includes the processes and attitudes of critical thinking as well as the techniques and instruments for collecting objective data.

Writers who have employed the "science of education" in the sense of content have not been explicit in regard to the nature of this content. Some imply that the findings of educational research—per cents, means, differences, standard deviations, probable errors, coefficients of correlation, regression equations, etc.—are to be regarded as contributions to the content of the science of education. Others appear to have

[4]Payne, W. H. *Contributions to the Science of Education*. American Book Company, New York, 1886. p. 17.

in mind definite rules or recipes for teaching and other phases of school work. Occasionally a writer indicates, as Dewey has done, that a science of education will consist of laws, principles, and general facts organized into a coherent system.

The factual finds of educational research are descriptive of the population or situation from which the data were obtained. These findings are to be regarded as contributing to a science of education only if they are useful as a basis for inferring what may be expected in other populations or situations. For example, the coefficient of reliability or probable error of measurement determined from the scores resulting from administering two forms of a test to a population of pupils is to be regarded as a contribution only if it is a dependable basis for inferring the magnitude of the variable errors of measurement to be expected when the test is administered to other groups of pupils. The findings of a controlled experiment in which Method A is compared with Method B are to be considered a contribution only if they are a dependable basis for inferring the relative effectiveness of these methods in other teaching situations.

The thesis of the preceding paragraph implies that a contribution to the science of education is not completed until the findings have been interpreted in terms of what may be expected in other populations or situations. In other words, the science of education consists not of the mere factual findings of educational research but rather of their interpretations. These interpretations will, in general, be principles and other broad generalizations rather than specific rules or recipes.

The existence of individual differences and the complexity and changing character of the educational situation must be recognized in interpreting research findings. The experimental finding in regard to the relative effectiveness of two methods of instruction is the difference between the mean gain in achievement of the two groups of pupils. An interpretation of this difference that Method A is superior to Method B means that Method A will be more effective *on the average*, not that it will be more effective for all pupils. A coefficient of correlation of .60 between the measures of two traits such as intelligence test scores and achievement test scores indicates that in general a low achievement score is paired with a low intelligence score and that a high achievement score is paired with a high intelligence score. But there are some exceptions. The coefficient of .60 indicates an "average" of the relationship. The situation is materially different from that with which the chemist deals. If several samples of a certain compound are taken, the chemical reactions will be the same for the same conditions. In interpreting his findings, the chemist does not have to make allowance for individual differences. The research worker in the field of education, on the other hand, makes interpretations in terms of averages or tendencies and in terms of deviations from the specified averages or tendencies.

The findings resulting from a study are descriptive of certain aspects of a situation, but this situation is determined by the status of other factors affecting it. The Starch-Elliott study of the marking of an examination paper in plane geometry revealed marks ranging from

28 to 92 for the same paper. These findings are descriptive of what happened when a certain examination paper was marked under certain conditions. When other investigators reported similar findings, the interpretation was made that the mark assigned to an examination paper by a teacher was so highly subjective that the essay examination is practically worthless as a measuring instrument. But more recent studies have revealed that the variability of the marks assigned to the same paper by a group of teachers is materially influenced by the character of the questions and the instructions given to the teachers. In other words, the Starch-Elliott findings were for certain conditions, and under changed conditions different findings are obtained.

When the complexity and changing character of the educational situation are contemplated, a fundamental question emerges: Is the educational situation sufficiently stable to make inferences concerning what may be expected that are dependable enough to be worthy of designation as contributions to a science of education? It is obvious that there is much change. We are living in a changing civilization and our schools are constantly being changed to meet the demands made upon them. Since 1900 the pupil population of our schools has changed in several respects and future change is probable, but the amount of change is not likely to be very great. Hence, the average status of the pupil population may be considered to be relatively stable, especially in respect to those traits that are heavily weighted by nature. For example, eye-movement studies have revealed that the character of the eye movements is indicative of the mental processes of the reader. It does not seem likely that changes in the pupil population will materially affect this relationship.

The educational situation includes also the curriculum and its accompanying educational philosophy, extracurricular activities, teachers, methods of teaching, organization, administration, supervision, buildings, and equipment. The changes in these factors in the future will probably be greater than those occurring in the average status of the pupil population. In view of the changing character of the educational situation it is imperative to inquire concerning the usefulness of research findings in controlling future educational practice. May we expect present determinations of the predictive value of prognostic measures to be applicable ten or even five years hence? Will present determinations of reliability and validity of measuring instruments be dependable for typical schools of the future? Are we justified in believing that the findings relative to motivation will be applicable in the schools of tomorrow? Will it be necessary to study anew the problem of transfer of training every few years? The list of such questions could be extended to all areas of research except those in which the findings are historical or merely records of current conditions or practices.

The answers to be given to such questions will vary. It has already been noted that the findings concerning the relation of eye movements to the mental processes of a reader will probably be relatively unaffected by changes in the educational situation. It is likely that many of the findings concerning child development will also be relatively unaffected. Similar expectations are probably justified in a number of other areas

of educational research. On the other hand, findings pertaining to the relative merits of instructional techniques, validity of measuring instruments, predictive value of prognostic measures, and a number of other problems will probably be decreasingly applicable as the educational situation changes. We might recognize two general classes of research findings—those whose applicability appears to be relatively permanent and those whose applicability is limited by the changing educational situation—but obviously no line of demarcation could be specified. A better plan would be to consider that an essential phase of a contribution to the science of education is an accompanying statement of the type of educational situation to which it is applicable. This would mean that the contributions (facts, principles, and laws) would include some items of relatively unrestricted application and others whose application would be restricted to a particular type of educational situation. In other words we might have, with respect to content, a science of education for traditional schools and another science of education for progressive schools. These two sciences of education might have some common content.

It is forty years since Rice reported his study of spelling and thereby precipitated the controversy that marks the beginning of the research movement in education. It is more than twenty-five years since Thorndike published his scale for measuring the quality of handwriting. It is twenty years since the publication of Rugg's text on the application of statistical methods in the field of education. For more than ten years research workers have been producing studies at a high rate. If the definition of a "research study" implied in the annual compilations issued by the United States Office of Education is accepted, the total number reported is probably close to fifty thousand and this accumulation is being increased at the rate of four to five thousand per year. Even if a restricted definition is employed, the total number of reported researches would still be impressive. What of our progress toward a science of education? In attempting an answer to this question, I shall consider it with reference to four lines of development: (1) instruments and techniques of educational research, (2) the degree to which research workers exemplify the scientific method, (3) the quality of general educational thinking, and (4) the content of a science of education.

As one examines reports of educational research and texts and other writings dealing with statistical methods and other techniques, it is apparent that much progress has been made in developing instruments and techniques for educational research. Hundreds of tests and scales have been constructed; a number have been studied critically so that their probable reliability and validity are known. Significant additions have been made to statistical techniques. Research workers may properly point with pride to the progress along these lines.

In appraising the progress toward being scientific in the study of educational problems, it is possible to cite an impressive number of studies which give evidence of critical thinking, and it may be noted that the frequency of the appearance of such studies is increasing. On the other hand, our research literature includes a much larger num-

ber of reports in which the quality of the thinking is not high. Many research workers have not been sufficiently critical of their data and of the techniques employed in dealing with them. Coefficients of correlation, probable errors, and other statistics have not been adequately understood. Some have been erroneously interpreted. Many studies appear to be efforts to defend or establish conclusions already reached. Frequently there is generalization from limited or unrepresentative data. There has been little verification of findings. The great mass of trivial and uncritical studies obscures our view of educational research that merits commendation and hence tends to make the total picture one which does not reflect much progress toward being scientific in dealing with educational problems. In making an appraisal, however, it is appropriate to note that the research movement in education extends back only about forty years and that the major portion of the work has been done during the past fifteen years.

In a very real sense research workers of the present generation are self-educated. Until very recently little opportunity for training in educational research was available, even in our larger graduate departments of education. Furthermore, beginning about 1920 there was an attempt on the part of certain leaders to increase the quantity of educational research. Teachers were urged to conduct experiments. The procedures of educational research were mechanized and made to appear simple. Graduate departments of education insisted that even masters' theses should be reports of research. Quantity production was attained, but at the expense of quality. However, as the better studies are sifted from the uncritical and the trivial, there is evidence of an increasing group of research workers who understand the techniques they employ and who are critical in interpreting their findings. The present tendency of research workers to subject their procedures to critical examination is doubtless indicative that an advanced stage in our progress is scientific in the study of educational problems.

When we examine the thinking in educational writings other than reports of research, the picture is less satisfying. In contrast to the antagonism aroused by Rice's report of his study of spelling and his plea for dealing with educational questions on the basis of objective data, there is today general approval of the scientific method, but there is much inconsistency between theory and practice. Opinionated discussions are still numerous. A large number of educational writings are biased arguments for or against some innovation or point of view. Such thinking, however, is not as significant as that of persons who pose as being scientific and decorate their writings with citations of research findings—coefficients of correlation, probable errors, critical ratios, and the like—and, in doing so, give evidence of little understanding of the citations they make. Some appear to select findings that support their opinions. I have heard it said of one of the outstanding leaders in the research movement that he is frequently not critical in his citation of research findings and that he is not above ignoring researches that do not support his opinions. There is much uncritical acceptance of findings when they agree with one's beliefs. The frequent reference to scientific curriculum construction implies an inadequate if not an erroneous

understanding of the scientific method. Methods of science cannot answer the question, What should be?

One index of the lack of critical thinking is furnished by the summaries of educational research which have become numerous in recent years. In most cases the reported conclusions of the studies listed are presented without evaluation. For example, in one summary in which 885 references are listed, evaluative statements were made in the case of only 52 of the studies and in only five cases was it indicated that the reported conclusion was lacking in dependability or was subject to qualification. In view of the difficulties encountered in educational research and the inadequacies of our techniques, it is inconceivable that in such a comprehensive list of references there should not be a much larger number of studies whose reported findings deserve criticism.

Perhaps we should not be too critical of educators who are laymen with respect to the field of educational research, especially since research workers have not set a very good example. But the uncritical acceptance and utilization of research findings is a matter of importance. Those of us who are interested in the future of educational research should be concerned about it. We should lend our influence to improving the quality of research rather than to promoting quantity production. We should recite technical terms less glibly and make explicit and precise the meaning we wish to express. We should be critical when we review reported researches, especially when we attempt to summarize the research relative to a problem. The seriousness of the situation is indicated by a letter I received a couple of years ago in which the writer proposed that we attempt to locate a few persons who would promise to prepare one frankly critical review of educational research a year.

Appraisal of our contributions to the content of a science of education is more difficult. The total number of studies recorded in periodicals, bulletins, monographs, and unpublished manuscripts is large. A measure of the amount of educational research is afforded by the bibliographies of the *Review of Educational Research*, which attempts to catalog the better researches. This bibliography contains 16,300 items. A few references are to other summaries, and there are some duplications and probably a number of worth-while studies that escaped the attention of the compilers. Hence, we may accept 16,000 as a conservative measure of the amount of educational research. The amount of educational research, however, is not a valid measure of the contributions of the content of a science of education. A number of the studies listed deal with trivialities, and the findings of others are not sufficiently dependable to be safe bases for generalizations. In many instances the findings of comparable investigations appear to be inconsistent. Many research workers have presented their findings as "food for thought" and have not "followed through" with an interpretation. There have been relatively few studies that provide verification of previously reported findings. Such observations suggest that the contributions to a science of education are relatively few in comparison with the number of reported researches, but they do not constitute an adequate appraisal.

During recent years there has been much listing and cataloging of studies. W. S. Gray, Buswell and Judd, Curtis, Lyman, and others have "summarized" the research in certain areas. *The Review of Educational Research*, initiated in 1931, presents in three-year cycles a "summary" of the entire field of educational research. These "summaries" are useful but they are little more than catalogs of reported studies. There is only a limited amount of critical evaluation and practically no synthesis and interpretation. The preparation of such bibliographies and "summaries" is only a step in the direction of what is needed. There has been no comprehensive attempt to synthesize and interpret the findings of the thousands of researches reported in our literature or recorded in unpublished manuscripts. For example, there is no source to which one may turn to ascertain what the findings of the studies relative to transfer of training "added up to" after critical evaluation and what inferences or conclusions may be drawn from such a synthesis. A similar statement may be made relative to almost any topic or area of educational research. For twenty-five years or more we have been piling up raw materials and parts from which it is likely that a science of education or at least a beginning of one could be constructed, but we have done little work on the assembly line. How long are we going to continue to pile up research findings before we attempt to see what we have and what we can make out of the accumulation!

Periodic inventories are regarded as essential to efficiency in business. Surveys of school systems are considered highly desirable. Educational research is thought of as contributing to efficiency in education, but research workers as a group have not exhibited much concern about efficiency in the expenditure of time and money devoted to their work. A comprehensive inventory of what has been accomplished has never been attempted. There has been no systematic attempt to sift the dependable research from the trivial and erroneous. There has been no systematic attempt to determine the problems that have been adequately studied and those that should receive attention. There is urgent need for a comprehensive and critical survey of what has been accomplished and an interpretation of the synthesis of findings resulting from this survey. Until these steps are taken, we cannot have an adequate appraisal of our efforts to develop a science of education. Perhaps such an appraisal will justify pointing with pride to the contributions, but at present we can only hope that time and money invested in educational research during the past forty years will prove to be justified.

The need for evaluating, synthesizing, and interpreting reported findings has been alluded to from time to time. In 1912 L. P. Ayres,[5] after pointing out that a "mass of superficial and erroneous results . . . will certainly be presented to the educational world in the guise of scientific contributions to applied pedagogy" stated: "in proportion as we are . . . enabled to retain the genuine and reject the spurious, education will move forward among the other sciences." Recognition of the need for synthesis and interpretation is implied in the "Fourth

[5]Ayres, L. P. "Measuring Educational Processes through Educational Results." *School Review* 20:309, May, 1912.

Report of the Committee on Economy of Time in Education" (*Eighteenth Yearbook of the Society for the Study of Education*, Part II, 1919) in which "Principles of Method" based on research findings are given for six elementary school subjects. In the Foreword the chairman of the Committee on the Economy of Time in Education refers to the volume as "A Handbook and Guide for Classroom Teachers and Supervisors."

It is encouraging that the need for a comprehensive evaluation, synthesis, and interpretation of the results of research is beginning to receive more insistent mention in our literature. In the *Educational Research Bulletin* for September 16, 1936, W. W. Charters commented editorially upon the need for what he designated as "an encyclopedia of educational research." His editorial was reprinted in the October-November number of the *Phi Delta Kappan* with emphatic endorsement by the editor of that journal. In *School and Society* for January 2, 1937, William McAndrew, after referring to the fluctuations in school practice, says, "A real obstacle to intelligent change is the absence of codified appraisals of different usages. The physician goes to his library and finds what has been done for an ailment such as is troubling his newest patient. The lawyer and engineer have convenient summaries of their whole field. One of the greatest needs of education is a corresponding compendium of procedures and results" (p. 36).

Regardless of the contention of those who insist that a science of education is not possible, the phrase is widely employed to designate a method of dealing with educational problems and a content consisting of facts and principles useful in controlling future educational experience. Within a period of forty years, notable contributions have been made to the methods and techniques of scientific inquiry in education. Conclusions reached relative to educational questions are determined less by casual observation, authority, and prejudice, and more by systematic observation and critical thinking. Some contributions have doubtless been made to the content of a science of education, but we have made little progress toward the development of a coherent system of laws, principles, and general facts. A comprehensive evaluation, synthesis, and interpretation of research findings is imperative for efficiency in building a science of education.

An Analysis of Efficiency in Addition

HENRY LESTER SMITH, Dean of the School of Education, and MERRILL T. EATON, Assistant Professor of Education, Indiana University

THE purpose of this investigation is to discover the factors affecting efficiency in addition by analyzing the performance of a group of college students in a series of addition problems under different drill conditions.

At the present time there are many conflicting viewpoints concerning the teaching of the fundamentals of arithmetic to elementary school pupils. In relation to addition some of the major controversial questions are: (1) the methods of teaching, (2) the length and distribution of drill periods, (3) the relative importance of speed and accuracy, (4) the degree of skill that should be developed, and (5) the type of problems that should be presented.

Some educators are now advocating that the development of skills in the fundamentals of arithmetic in the elementary schools should be limited to everyday adult needs. Others maintain that much of the educational value of the study of arithmetic would be lost if the acquisition of skills in this subject were limited to the mere practical needs of the individual. Still other school officials believe that, because of the rapid disintegration of computational skills, as shown by speed and accuracy tests of adults, much of the time spent in drill on the fundamentals of arithmetic could be more profitably used in other ways.

The teaching of arithmetic is relatively well standardized, yet studies of failures in the elementary school have shown that more pupils fail in arithmetic (7, p. 5) than in any other elementary subject. Failures are not limited entirely to the low ability group, as many pupils who are of normal intelligence fail in arithmetic. The striking individual differences in arithmetical ability among elementary pupils seem to increase with maturity. The present methods of teaching arithmetic must be in part responsible for this condition.

There have been relatively few psychological analyses of adding efficiency. Some of the important reasons for the lack of psychological analysis are (1) the emphasis placed on tests and measurements, (2) the development of curricula by students of education, and (3) the difficulty in devising methods and techniques by which psychological analyses can be made.

Because of the conflicting viewpoints in both theory and practice in relation to the development of skills in addition, this investigation should help to clarify the situation by determining some of the basic factors affecting efficiency in addition and by developing a methodology in the study of the problems involved. Although the study is limited to a consideration of the acquisition of skill in addition and the subjects

are college students, the results should be broadly applicable to drill conditions of the elementary school pupil.

The literature dealing with the various aspects of arithmetic is extensive. In 1925 Buswell and Judd (5) published a summary of the educational investigations relating to arithmetic. The summary includes all the available investigations which the authors considered as research or critical discussions of some phase of arithmetic. The annotated bibliography contains 320 titles. Each year since 1925 Buswell (4) has published a supplement to the original bibliography. The supplement, as well as the original publication, contains a critical discussion of many of the investigations in addition to the annotated bibiliography.

The *Twenty-ninth Year Book of the National Society for the Study of Education* (8) consists of the report of the society's committee on arithmetic. A bibliography of studies concerning arithmetic is included and a number of the studies are analyzed and discussed.

Studies of *Consumer's Uses of Arithmetic* by Bowden (2), *Arithmetic Tests and Studies in the Psychology of Arithmetic* by Counts (6), and *Psychological Analysis of the Fundamentals of Arithmetic* by Judd (7) are typical of the more extensive investigations dealing with arithmetic.

EXPERIMENTAL CONDITIONS

The experimental conditions are as follows:

Subjects.—The subjects were an unselected group of 158 college students. There were 129 subjects in the experimental group and 29 in the control group. The age, sex, and class distribution of the subjects in the two groups are given in Table I. The distribution of the subjects in relation to age and class is similar, but the precentage of men is approximately twice as great in the experimental group as in the control.

TABLE I. AGE, SEX, AND CLASS DISTRIBUTION OF SUBJECTS

	Age										Sex		Class			
	16	17	18	19	20	21	22	23	24	39	M	F	Fr	S	Jr	Sr
No. in experimental group	1	11	33	42	23	10	5	2	0	2	54	75	48	65	8	8
No. in control group	0	3	5	4	9	6	1	0	1	0	6	23	9	13	6	1

Experimental materials.—The 660 two-column problems were organized into 33 units, with 20 problems in each unit. The 33 units were divided into four series, A, B, C, and D. There were nine units each in Series A, B, and C, and six units in Series D. In the series of nine units each, there were three units of two-column problems, 8 digits high; three units of two-column problems, 13 digits high; and three units of two-column problems, 18 digits high. In Series D there were two 8-digit, two 13-digit, and two 18-digit units of problems. Regardless of the

series, units one, four, and seven were 8-digit problems; units two, five, and eight were 13-digit problems, and units three, six, and nine were 18-digit problems. An illustration of the problems of each of these units is presented in Figure 1.

A-1

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
25	38	49	52	63	74	86	97	80	42	30	94	76	85	71	84	75	62	53	72
82	52	34	36	78	92	37	54	62	35	17	36	81	92	31	82	83	19	82	96
72	16	93	64	51	72	37	84	19	28	53	63	26	28	95	82	61	24	73	64
15	34	24	25	37	48	59	60	98	92	83	74	76	34	25	46	57	39	62	18
75	37	38	29	30	17	64	72	34	65	37	62	16	35	48	58	91	63	74	94
65	27	87	92	31	86	26	28	35	85	92	16	85	46	72	82	93	74	62	26
11	75	62	93	53	75	82	16	62	42	36	91	74	23	25	63	94	64	18	93
92	75	32	74	37	29	85	67	82	34	76	82	37	46	29	85	74	62	91	83

8-digit

A-2

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
82	4	85	9	17	38	29	47	68	59	35	27	39	46	30	18	96	75	35	35
61	94	81	82	93	84	83	75	60	91	68	35	26	82	95	97	62	18	74	26
72	16	72	53	95	75	42	36	78	67	56	34	23	45	36	57	69	63	65	18
72	34	37	58	47	58	29	81	74	12	86	54	36	29	45	78	90	13	34	56
81	56	81	29	36	74	92	36	65	13	76	97	86	74	25	74	18	61	56	81
75	92	67	91	56	42	36	58	79	56	71	84	46	23	53	75	86	97	86	43
20	39	48	57	65	78	49	30	91	85	13	85	73	23	54	98	87	56	41	73
39	82	16	78	86	37	20	41	83	75	72	93	75	64	32	13	64	36	29	84
12	46	36	15	74	83	20	48	64	12	83	18	64	32	55	77	17	38	73	48
83	54	72	13	85	36	52	39	48	15	75	48	39	28	74	65	83	28	94	68
34	28	62	38	48	67	58	74	13	86	42	35	48	48	58	49	39	52	18	31
56	48	38	48	32	34	54	64	18	54	30	39	28	65	46	37	28	38	12	36
86	36	57	48	20	38	67	86	85	42	36	48	51	23	85	92	31	42	41	95

13-digit

A-3

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
73	46	20	93	84	75	68	59	28	38	49	23	34	45	56	67	78	89	78	97
87	76	85	54	43	32	25	36	47	58	69	70	12	31	47	17	63	48	12	37
24	35	46	23	34	45	56	67	78	89	90	19	68	74	53	42	35	46	41	38
72	38	94	13	23	15	94	86	72	35	36	48	91	34	56	32	13	35	86	41
56	47	38	29	54	65	71	83	62	39	14	68	13	82	83	53	84	19	58	34
12	13	14	15	16	17	18	83	86	53	47	86	97	14	35	47	68	79	52	36
53	46	27	48	94	58	79	20	17	35	47	58	82	15	67	58	49	30	42	35
64	53	45	76	84	35	64	27	64	86	97	84	16	74	24	36	54	86	97	81
12	36	57	68	49	58	27	46	37	58	49	51	34	45	21	48	59	35	63	18
74	58	39	28	36	57	39	16	12	40	58	53	78	35	10	34	63	46	54	23
16	57	64	35	62	35	86	75	97	86	73	54	42	32	65	10	86	94	60	81
63	46	24	74	97	86	19	58	76	12	30	76	85	64	86	79	14	53	52	51
15	48	39	83	47	65	18	39	75	63	45	13	42	81	32	54	76	54	42	16
75	63	28	39	40	51	67	21	38	49	57	68	35	26	47	68	94	72	63	45
14	38	72	13	81	43	15	76	49	30	20	48	41	53	58	19	13	75	43	64
75	46	35	29	15	47	58	69	30	29	38	47	35	46	18	23	34	56	78	97
82	35	46	57	68	72	39	41	57	38	29	37	46	18	79	57	46	23	34	54
15	65	42	35	46	57	68	93	64	15	65	41	38	98	78	69	16	41	58	91

18-digit

FIG. 1. Examples of the units of 8-, 13-, and 18-digit problems

Construction of problems.—There were 220 of the 8-digit problems, 220 of the 13-digit problems, and 220 of the 18-digit problems, making a total of 660 different problems. The 220 two-column, 8-digit problems were placed on separate cards. These cards were placed in a box and mixed. The 20 cards were withdrawn. These 20 cards were labeled series A-1, constituting the first unit of the 8-digit problems. The next 20 cards were labeled series A-4, and the procedure of withdrawing cards was continued until the 11 units of the 8-digit problems were completed. The 11 units of the 13-digit problems and the 11 units of the 18-digit problems were constructed in exactly the same manner. Although there possibly may be slight differences in difficulty between the single problems in the different units, the units of each series as a whole are approximately equal in difficulty and are therefore directly comparable.

Length of drill period.—Preliminary experimentation with different length drill periods indicated that a five-minute period was the unit of time most satisfactory for the type of problems used in this investigation. The conclusions from certain other investigations of adding efficiency (1, 3) have indicated that the five-minute period is one of the most desirable units of time for drill in addition. In the preliminary experimentation with the five-minute drill period, it was found that those subjects with better than average adding ability could complete a unit of the 8-digit problems during the drill period; only those with superior adding efficiency could finish a unit of the 13-digit problems; and the completion of a unit of the 18-digit problems in the five-minute period by any subject was highly improbable.

Order of presenting units.—The order of presenting the 33 units of problems was as follows: The nine units of Series A, in order, followed by the nine units of Series B and C, and the six units of Series D. Drill periods were conducted on Mondays, Wednesdays, and Fridays. Each subject was given his five-minute drill period on the one unit of 20 problems at the same time each day. The drill on any one day was limited to the one unit of problems during the five-minute period.

Drill conditions, experimental group.—The controllable conditions were constant except for two variables. The variables were (1) the length of the problems, and (2) the different instructions in relation to speed and accuracy given to the subjects for the units of problems in each series. The specific instructions for each of the four series for the subjects of the experimental group were as follows:

Series A. No instructions in relation to speed and accuracy.

Series B. Add as rapidly as possible. Give no consideration to accuracy.

Series C. Be accurate. Give no consideration to speed.

Series D. Add rapidly but be accurate.

The laboratory in which the experiment was conducted consisted of a normal, natural, learning environment, and objective distractions were reduced to the minimum. An average of 25 subjects participated at

each drill period. As soon as the subjects were seated after entering the laboratory, copies of the unit they were to work on that day were given to them face down. They were first instructed to write their names on the backs of their sheets. At the command "Work" they were instructed to turn over their sheets and, beginning with Problem No. 1, to add until the command "Stop." The subjects were informed that they were to have five minutes to add and that, on the command "Stop," they were to stop adding immediately and to turn over their sheets. If the units were from Series B, C, or D, the specific instructions relative to speed and accuracy for the units in these series were repeated at the beginning of each drill period.

The important measures of adding efficiency computed are as follows:

1. The number of columns added. The number of columns added consisted of the number of columns the subject attempted to add. If the subject computed an answer for the column regardless of whether it was correct or incorrect, it was counted as an attempt, a column added. There were 20 problems of two columns in each unit making the highest number of columns on any one unit 40.

2. The number of columns added correctly.

3. The number of columns added incorrectly.

4. Error score. Because of the greater difficulty in adding the second column correctly, an arbitrary method of scoring errors was devised. If the answer to the first column (right-hand column) in a problem was incorrect it was scored as three error points; if the answer to the second column (left-hand column) was incorrect, it was scored as two error points. Therefore, if the answers to both columns were incorrect, an error score of five points was recorded for the problem.

5. Positive score. The method of scoring correct answers was similar to that used in scoring incorrect answers. If the answer to the first column was correct, it was given a positive score of two points; if the second column was correct, it was given a positive score of three points, making a positive score of five points for each problem if the answers to both columns were correct. Therefore, the highest positive score that could be made on the unit was 100 points.

6. Amount of work done. The score for the amount of work done was computed by multiplying the number of columns added by the number of combinations in the column. In the 8-digit problems there were seven combinations in each column plus the additional combination of the carried number, making a total of 15. In the 13-digit problems there were 12 combinations in each column plus the additional combination of the carried number, making a total of 25 combinations. In the 18-digit problems there were 17 combinations plus the additional combination of the carried number, making a total of 35 combinations. The highest possible score for the amount of work done for a unit of each length problem was:

8-digit—15 x 20=300
13-digit—25 x 20=500
18-digit—35 x 20=700

7. Methods of adding. An observation chart containing a large number of items relative to methods of adding was prepared. Each subject was individually observed a number of times by the experimenter and the methods of adding were recorded. When the subject finished the 33 units of problems, he executed a similar chart. The experimenter's and the subjects' charts were compared and, where conflicts were found, the subjects were re-examined.

Drill conditions, control group.—All phases of the experimental conditions for the control group were exactly the same as those for the experimental group except that *there were no instructions given concerning speed and accuracy for any of the units of problems in any of the series.*

RESULTS

Individual differences.—There were marked individual differences in ability to add. These individual differences may be studied by examining the range in scores, e.g., the difference in magnitude between the highest and lowest scores. The range of scores for the number of columns added, error scores, positive scores, and the amount of work done are given in Table II. The range of scores for the number of columns added in the units of the 8-digit problems was in the ratio of approximately 2.5 to 1. In the units of the 13-digit problems the ratio between the highest and lowest scores increased to about 4.5 to 1. The range in number of columns added for the units of the 18-digit problems was similar to that for the units of the 13-digit problems. The units of the 13-digit problems tended to increase individual differences but there was no tendency for a similar increase in the units of the 18-digit problems. The demands for speed (units of Series B), for accuracy (units of Series C), and for speed and accuracy (units of Series D) had no marked effect on the range of the number of columns added.

TABLE II. RANGE OF SCORES—EXPERIMENTAL GROUP

Series	Units	Columns added	Error score	Positive score	Work done
A	1–4–7	15–40	0–21	21–99	113–300
B	1–4–7	18–40	1–61	13–99	135–300
C	1–4–7	18–40	0–16	29–100	135–300
D	1–4	16–40	0–17	27–100	120–300
A	2–5–8	8–39	0–31	7–91	100–488
B	2–5–8	9–40	0–38	6–95	113–500
C	2–5–8	9–40	0–13	9–93	113–500
D	2–5	10–40	0–22	13–95	125–500
A	3–6–9	5–26	1–23	2–48	88–455
B	3–6–9	6–28	1–32	2–57	105–490
C	3–6–9	5–27	0–17	7–56	88–473
D	3–6	7–28	1–22	7–59	123–490

It has generally been assumed that the more difficult the task the greater the distance will be between the most efficient and the least efficient individuals. These data show, however, that this distance in the units of 18-digit problems did not increase materially over that existing in the units of 13-digit problems.

The variability of the range of error scores precluded the stating of any approximate ratio between the highest and lowest scores. The difference between the highest and lowest error scores was, however, much greater than the difference in the number of columns added. The lower range of scores was zero or near zero in all cases. There was a slight tendency for individual differences to increase in the units of the 13-digit problems and to decrease in the units of the 18-digit problems. The demands for speed greatly increased the differences between the highest and lowest error scores.

The effect of the demand for speed was more pronounced in increasing individual differences in the units of the 8-digit problems than in the units of the 13-digit problems. The demand for speed had little effect on modifying individual differences in the units of the 18-digit problems. The demand for accuracy reduced individual differences. The greatest reduction was in the units of the 13-digit problems. The demand for speed and accuracy increased individual differences above that of the demand for accuracy, but to a much less degree than the demand for speed. The effect of the demand for speed and accuracy was least apparent in the units of the 8-digit problems and most apparent in the units of the 13-digit problems. The demands for speed, accuracy, and speed and accuracy caused greater variations in individual differences in error scores than in number of columns added.

The data in Table II show that individual differences in positive scores were similar to those discovered in the number of columns added. The range in positive scores was modified by the same factors and to approximately the same extent as were the scores for the number of columns added.

The range in scores for the amount of work done in the units of the 8-digit problems was in the ratio of approximately 2.5 to 1. In the units of the 13-digit problems the ratio between the highest and lowest scores was increased to about 4.5 to 1. The ratio was slightly reduced in the units of the 18-digit problems. An examination of the data in Table II shows that the demands for speed, accuracy, and speed and accuracy had little effect in changing individual differences in amount of work done.

After making an exhaustive study of the range of variability of a number of human capacities, Wechsler (10) concluded that the limits of variability of most human capacities approximated the 2 to 1 ratio. He admitted, however, that there were certain capacities where the ratio was much greater. Individual differences in adding efficiency as measured in this study are considerably higher than the differences found by Wechsler for the capacities he studied.

Individual differences were not greatly affected by the length of the problems. There was a slight tendency for individual differences to

increase in the units of the 13-digit problems but no additional increases were noted in the units of the 18-digit problems. The demands for speed, accuracy, and speed and accuracy produced marked variations in individual differences in error scores. In the other measures, number of columns added, positive scores, and amount of work done, little effect was noted.

Improvement in efficiency resulting from drill.—Improvement in adding efficiency resulting directly from drill may best be studied by examining the scores of the control group. The average number of columns added in the units of the 8-, 13-, and 18-digit problems in each series is given under the caption "control" in Table III. The data are organized so that improvement or lack of improvement in each of the three length problems in the four series may be studied. The first column of figures represents the average number of columns added; the second shows the improvement or lack of improvement in the number of columns added over the number added during the first drill period. Increases and decreases were computed on the basis of the number of columns added in Series A of each length problem. The third column of figures is the percentage of increase or decrease in number of columns added. Plus signs indicate increases and minus signs indicate decreases.

TABLE III. AVERAGE NUMBER OF COLUMNS ADDED BY THE EXPERIMENTAL AND CONTROL GROUPS

Series	Units	Experimental group			Control group			Difference in percentage of change
		No. of columns added	Change	Percentage of change	No. of columns added	Change	Percentage of change	
A	1–4–7	29.89			25.96			
B	1–4–7	31.89	+2.00	+6.69	26.57	+0.61	+2.35	+4.34
C	1–4–7	31.31	+1.42	+4.75	26.59	+0.63	+2.43	+2.32
D	1–4	31.70	+1.81	+6.06	25.74	−0.22	−0.85	+6.91
Average		31.20	+1.74	+5.83	26.22	+0.34	+1.31	+4.52
A	2–5–8	17.27			13.80			
B	2–5–8	19.90	+2.63	+15.23	15.59	+1.79	+12.97	+2.26
C	2–5–8	18.25	+0.98	+5.67	15.01	+1.21	+8.77	−3.10
D	2–5	19.74	+2.47	+14.30	15.24	+1.44	+10.43	+3.87
Average		18.79	+2.03	+11.73	14.91	+1.48	+10.72	+1.01
A	3–6–9	11.01			9.33			
B	3–6–9	13.51	+2.50	+22.71	9.70	+0.37	+3.97	+18.74
C	3–6–9	11.66	+0.65	+5.90	9.48	+0.15	+1.61	+4.29
D	3–6	12.53	+1.52	+13.81	9.52	+0.19	+2.04	+11.77
Average		12.18	+1.56	+14.14	9.51	+0.24	+2.54	+11.60

The 11 five-minute drill periods produced little increase in the number of columns added in the units of the 8-digit problems, the average increase being 1.31 per cent. In the units of the 13-digit problems the average increase was 10.72 per cent, and of the 18-digit problems 2.54 per cent. Except in the units of the 13-digit problems, the 33 five-

minute drill periods produced but slight increase in the number of columns added.

The average positive scores made by the control group in the units of the 8-, 13-, and 18-digit problems are given under the caption "control" in Table IV. Improvement over initial performance was made in each of the different length problems. In the units of the 8-digit problems there was an average improvement of 4.87 per cent, of the 13-digit problems, 14.49 per cent, and of the 18-digit problems, 3.42 per cent. The percentage of improvement was relatively constant in the units of each length problem with the greatest average improvement being made in the units of the 13-digit problems and the least in the units of the 18-digit problems.

TABLE IV. AVERAGE POSITIVE SCORES MADE BY THE EXPERIMENTAL AND CONTROL GROUPS

Series	Units	Experimental group			Control group			Difference in percentage of change
		Positive score	Change	Percentage of change	Positive score	Change	Percentage of change	
A	1–4–7	68.39			57.07			
B	1–4–7	71.46	+3.07	+4.49	60.72	+3.65	+6.40	−1.91
C	1–4–7	73.37	+4.98	+7.28	59.43	+2.36	+4.14	+3.14
D	1–4	74.81	+6.42	+9.39	59.40	+2.33	+4.08	+5.31
Average		72.01	+4.82	+7.05	59.16	+2.78	+4.87	+2.18
A	2–5–8	33.97			28.13			
B	2–5–8	38.60	+4.63	+13.63	31.95	+3.82	+13.58	+0.05
C	2–5–8	39.79	+5.82	+17.13	31.99	+3.86	+13.72	+3.41
D	2–5	41.58	+7.61	+22.40	32.68	+4.55	+16.17	+6.23
Average		38.49	+6.02	+17.72	31.19	+4.08	+14.49	+3.23
A	3–6–9	19.22			16.50			
B	3–6–9	22.00	+2.78	+14.46	16.66	+0.16	+0.97	+13.49
C	3–6–9	22.82	+3.60	+18.73	16.93	+0.43	+2.61	+16.12
D	3–6	23.27	+4.05	+21.07	17.60	+1.10	+6.67	+14.40
Average		21.83	+3.48	+18.09	16.92	+0.56	+3.42	+14.67

The average error scores made by the control group in the units of the 8-, 13-, and 18-digit problems are given in Table V under the caption "control." Error score reductions in the units of the 8-digit problems vary from 5.12 per cent on units 1, 4, and 7 in Series C to 30.58 per cent on units 1 and 4 in Series D, an average error reduction of 16.58 per cent. In the units of the 13-digit problems there was an average error score reduction of 19.14 per cent. There was greater variability in error scores resulting from practice in the units of the 18-digit problems than there was in the units of the 8- and 13-digit problems. The average error score reduction in the units of the 18-digit problems was only 1.10 per cent. Average error score reductions were relatively high in the units of the 8- and 13-digit problems, but were insignificant in the units of the 18-digit problems.

TABLE V. AVERAGE ERROR SCORES MADE BY THE EXPERIMENTAL AND CONTROL GROUPS

Series	Units	Experimental group			Control group			Difference in percentage of change
		Error score	Change	Percentage of change	Error score	Change	Percentage of change	
A	1–4–7	7.59			6.05			
B	1–4–7	9.80	+2.21	+29.12	5.20	−0.85	−14.05	+43.17
C	1–4–7	4.48	−3.11	−40.97	5.74	−0.31	−5.12	−35.85
D	1–4	4.51	−3.08	−40.58	4.20	−1.85	−30.58	−10.00
Average		6.60	−1.33	−17.48	5.30	−1.00	−16.58	−0.90
A	2–5–8	8.31			6.46			
B	2–5–8	10.22	+1.91	+22.98	6.11	−0.35	−5.42	+28.40
C	2–5–8	4.69	−3.62	−43.56	4.95	−1.51	−23.37	−20.19
D	2–5	6.55	−1.76	−21.18	4.61	−1.85	−28.64	+7.46
Average		7.44	−1.16	−13.92	5.53	−1.24	−19.14	+5.22
A	3–6–9	8.74			6.08			
B	3–6–9	10.73	+1.99	+22.77	6.78	+0.70	+11.51	+11.26
C	3–6–9	5.90	−2.84	−32.49	5.94	−0.14	−2.30	−30.19
D	3–6	6.87	−1.87	−21.40	5.32	−0.76	−12.50	−8.90
Average		8.06	−0.91	−10.37	6.03	−0.07	−1.10	−9.28

The average amount of work done by the control group in the units of the 8-, 13-, and 18-digit problems in the four series is given under the caption "Control group" in Table VI. There was an average increase of 5.95 per cent in amount of work done in the units of the 8-digit problems. In the units of the 13-digit problems the average improvement in amount of work done increased to 10.52 per cent. The average increase (0.67 per cent) in the units of the 18-digit problems was negligible.

TABLE VI. AVERAGE AMOUNT OF WORK DONE BY THE EXPERIMENTAL AND CONTROL GROUPS

Series	Units	Experimental group			Control group			Difference in percentage of change
		Amount of work done	Change	Percentage of change	Amount of work done	Change	Percentage of change	
A	1–4–7	228.83			184.90			
B	1–4–7	236.68	+7.85	+3.43	196.71	+11.81	+6.39	−2.96
C	1–4–7	232.97	+4.14	+1.81	198.51	+13.61	+7.36	−5.55
D	1–4	236.13	+7.30	+3.19	192.49	+7.59	+4.10	−0.91
Average		233.65	+6.43	+2.81	193.15	+11.00	+5.95	−3.14
A	2–5–8	215.83			172.20			
B	2–5–8	249.84	+34.01	+15.76	195.70	+23.50	+13.65	+2.11
C	2–5–8	227.43	+11.60	+5.37	187.55	+15.35	+8.91	−3.54
D	2–5	246.77	+30.94	+14.34	187.70	+15.50	+9.00	+5.34
Average		234.97	+25.52	+11.82	185.79	+18.12	+10.52	+1.30
A	3–6–9	198.23			166.41			
B	3–6–9	236.37	+38.14	+19.24	169.53	+3.12	+1.87	+17.37
C	3–6–9	204.85	+6.62	+3.34	167.27	+0.86	+0.52	+2.82
D	3–6	219.71	+21.48	+10.84	165.80	−0.61	−0.37	+11.21
Average		214.79	+22.08	+11.14	167.25	+1.12	+0.67	+10.47

In comparing the average amount of work done in each length problem, it was found that the most work (193.15) was accomplished in the units of the 8-digit problems. In the units of the 13-digit problems the average amount of work dropped to 184.55, and of the 18-digit problems to 167.50. As the problems increased in length there was a reduction in amount of work done per unit of time.

The lack of any marked improvement in positive scores or in reduction of error scores may be seen by examining the curves in Figure 2. Slight improvement in positive scores is noted in the units of the 8- and 13-digit problems but the section of the curve representing the positive scores in the units of the 18-digit problems is practically a straight line. The curve for the average error scores is almost a straight line throughout its entire length, showing that error scores were not greatly affected by either practice or the length of the problem. This indicates that errors were due to factors other than the number of combinations in the problem.

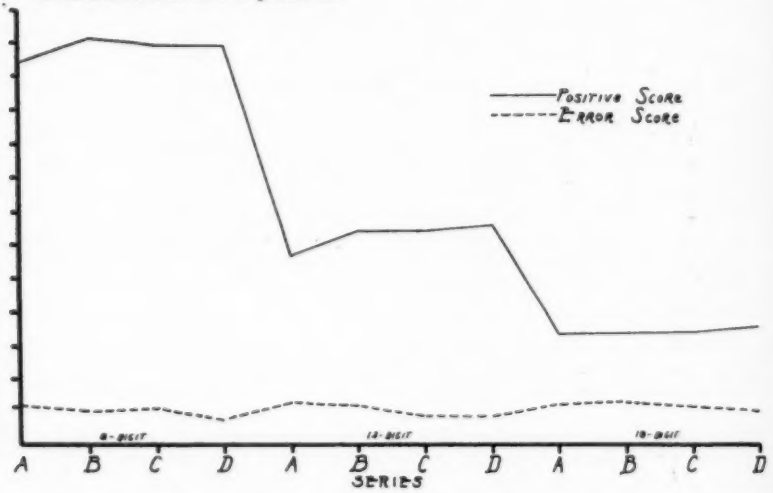

FIG. 2. The average positive scores and the average error scores made by the control group

The effect of 33 five-minute drill periods on the amount of work done and the number of columns added may be studied by examining the curves in Figure 3. It will be noted that there was a slight improvement in the units of the 8- and 13-digit problems but that there is a decrease in efficiency in the units of the 18-digit problems. The downward slope of the curve representing the amount of work done shows that there was more reduction in number of columns added than should result from the increased difficulty of the longer problems. The amount of work done in each length problem was directly comparable, and, if the number of columns added were reduced in proportion to

the number of digits in the problem, the curve representing the amount of work done should have been approximately a straight line.

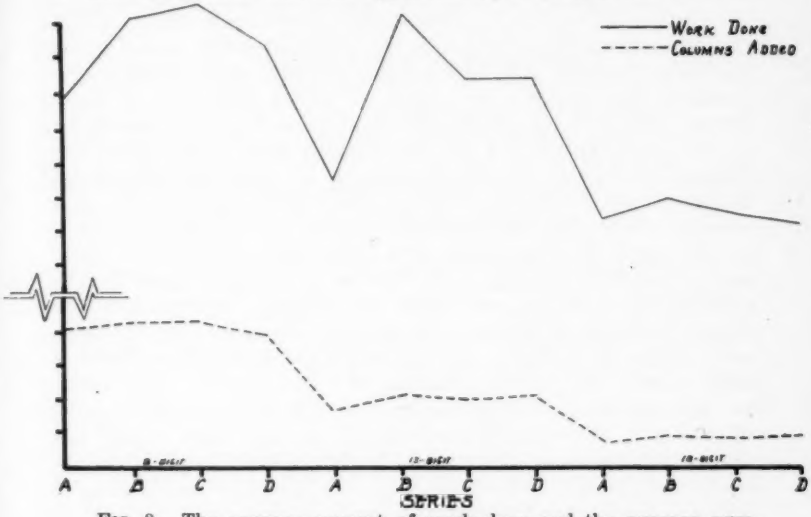

FIG. 3. The average amount of work done and the average number of columns added by the control group

The important conclusions relative to the effect of drill on adding efficiency are:

1. Rote drill consisting of 33 five-minute periods produced but slight improvement in the number of columns added, positive scores, and amount of work done.

2. The greatest improvement in number of columns added and positive scores was in the units of the 13-digit problems; the least improvement was in the units of the 18-digit problems.

3. Error score reductions were slight, the greatest being in the units of the 13-digit problems and the least in the units of the 18-digit problems.

4. Increase in the length of problems did not increase error scores.

5. Errors were apparently due to conditions other than the number of combinations in the problems.

6. The reduction in average number of columns added with increase in length of problems was greater than the proportional increase of digits.

The effect of the demands for speed, accuracy, and speed and accuracy on adding efficiency.—The effect of instructing the subjects of the experimental group to add rapidly without regard to accuracy in the units of Series B, to add accurately without regard for speed in the units of Series C, and to add both rapidly and accurately in the units of

Series D may be determined by comparing the efficiency of the experimental group with that of the control.

The average number of columns added in the units of the 8-, 13-, and 18-digit problems in each series by the experimental and control groups is given in Table III. The data in the last column of this table are the percentage gain (or loss) in number of columns added by the experimental group over the control. Since the drill conditions were similar for the two groups except for the instructions concerning speed and accuracy for the units of Series B, C, and D for the experimental group, the gain or loss of the experimental group over the control group represents the effects of the instructions on the number of columns added.

The initial efficiency (units 1, 4, and 7, Series A) of the experimental group was superior to that of the control group and this superiority was maintained throughout the subsequent drill periods. The change in number of columns added and the percentage change is computed on the basis of the number of columns added in the units of Series A for each length of problems.

In the units of the 8-digit problems the experimental group gained an average of 1.74 columns, a gain of 5.84 per cent. The average percentage gain for the control group was 1.31 per cent. The average percentage gain of the experimental group over the control group was 4.52 per cent. The experimental group gained 2.03 columns in the units of the 13-digit problems, a percentage gain of 11.73. The control group gained 1.48 columns, a percentage gain of 10.72. The net gain of the experimental group over the control group was 1.01 per cent. In the units of the 18-digit problems the experimental group gained 14.14 per cent and the control group 2.54 per cent, making a net gain of 11.60 per cent by the experimental group. These data show that the instructions had a motivating effect. In relation to the length of the problems, the effect was less pronounced in the units of the 13-digit problems and most marked in the units of the 18-digit problems.

The difference in the effect of the demands for speed (Series B), accuracy (Series C), and speed and accuracy (Series D) may be determined by comparing the percentage gain in Series B, C, and D. In general there was the greatest gain in number of columns added when both speed and accuracy were demanded, considerable gain when speed was demanded, and less gain when accuracy was demanded.

The effect of the demands for speed, accuracy, and speed and accuracy on the number of columns added may be seen by examining the curves in Figure 4. The solid line represents the number of columns added by the experimental group and the dash line indicates the number by the control group. These curves show that the instructions for Series B, C, and D produced a gain over the performance of the control group in the same series. The rise in the curve of the experimental group in the units of Series B, the drop in the units of Series C, and the rise in the units of Series D show the varying effects of the different instructions.

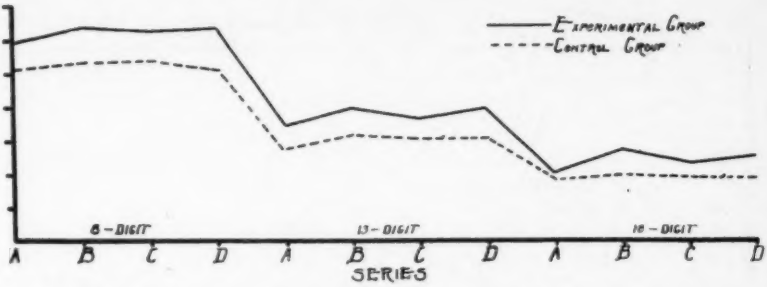

FIG. 4. The average number of columns added by the experimental and control groups

The average positive scores made by the experimental and control groups are given in Table IV. In the units of the 8-digit problems the experimental group gained 7.05 per cent and the control group gained 4.87 per cent, making a net gain of 2.18 per cent for the experimental group. In the units of the 13-digit problems the experimental group gained 3.23 per cent more than the control group, while in those of the 18-digit problems its gain was much higher, 14.67 per cent. The gain by the experimental group over the control group in positive scores due to the instructions given for the units of Series B, C, and D was similar to that in the number of columns added.

An examination of the curves in Figure 5 shows that for each of the three length problems there was more improvement by the experimental group than by the control. Improvement was consistent, with slight improvement on the units of Series B, more on Series C, and still greater gain on Series D. The positive scores did not fluctuate up with the demand for speed, down with the demand for accuracy, and up again with the demand for speed and accuracy as did the curves for the number of columns added.

The average error scores made by the experimental and control groups are given in Table V. Error scores were affected to a much greater extent by the instructions than were the number of columns added or the positive scores. In the units of 8-digit problems the demand for speed increased the error score 29.12 per cent. The demand for accuracy and for speed and accuracy reduced the error score 40.97 and 40.58 per cent respectively. The average reduction in error score by the experimental group was 17.48 per cent, and by the control group 16.58 per cent, a difference of only 0.90 per cent.

In the units of the 13-digit problems the error score of the experimental group was reduced 13.92 per cent and of the control group 19.14 per cent. *The error score of the control group was reduced 5.22 per cent more than that of the experimental group.* The average reduction in error scores by the experimental group in the units of the 18-digit problems was 10.37 per cent, by the control group 1.10 per cent, a difference of 9.28 per cent.

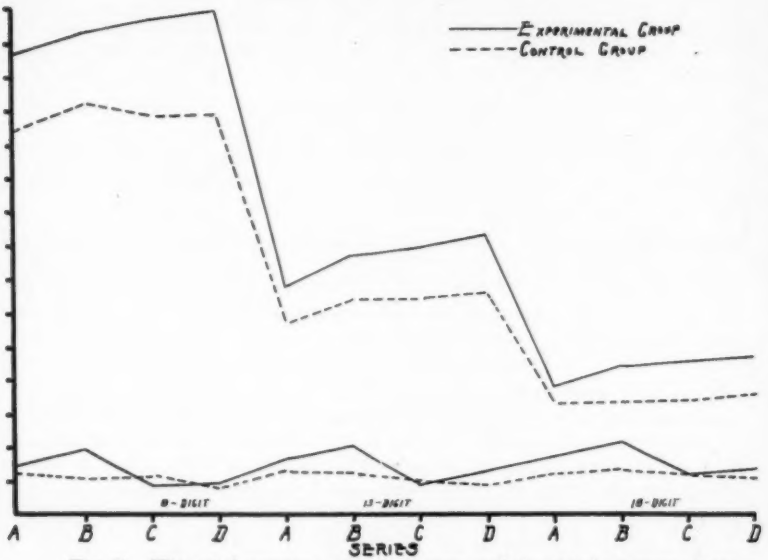

FIG. 5. The total average positive scores and the total average error scores made by the experimental and control groups

In each instance the demand for speed produced a large increase in error scores, and the demand for accuracy and for speed and accuracy produced a great reduction in error scores. The demand for accuracy, however, produced a greater reduction in error scores than did the demand for speed and accuracy.

The effect of the demands for speed, accuracy, and speed and accuracy may be seen by examining the curves in Figure 5. The dash line representing the average error scores of the control group is practically a straight line, while the upward trend of the solid line, representing the average error scores of the experimental group on the units of Series B, is quite steep. The drop of the curve in the units of Series C and the upward trend in the units of Series D is noticeable.

The average amount of work done by the experimental and control groups is given in Table VI. In the units of the 8-digit problems the control group gained 3.14 per cent more than the experimental group. The experimental group gained 1.30 per cent more than the control group in the units of the 13-digit problems and 10.47 per cent more on the units of the 18-digit problems. The demands for speed, accuracy, and speed and accuracy had little effect on the performance of the subjects of the experimental group in the units of the 8- and 13-digit problems. The motivating effects of the instructions were, however, more pronounced in the units of the 18-digit problems.

A more direct method of determining the effect of the demands for speed, accuracy, and speed and accuracy may be made by studying the percentage of gain in efficiency of the experimental group over the

control in the units of Series B, C, and D. These data are given in the last columns of Tables III, IV, and V and are plotted in the curves in Figure 6.

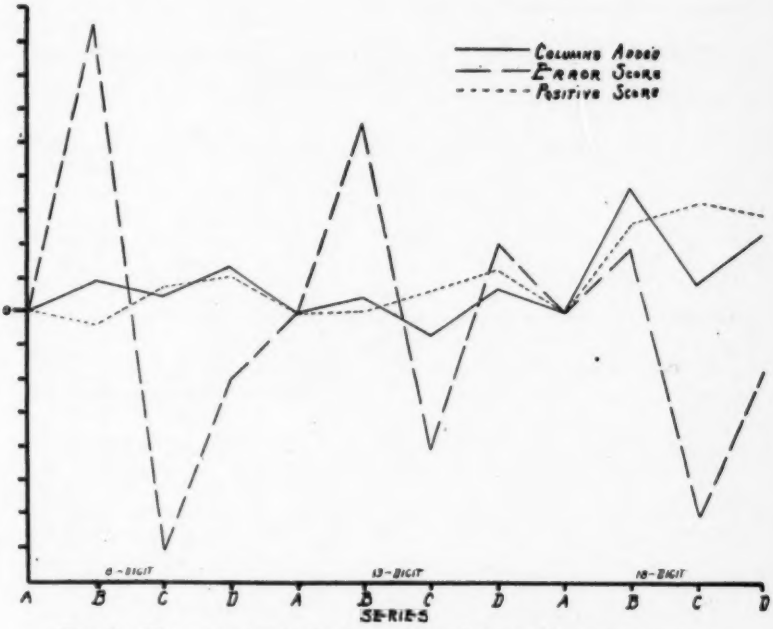

FIG. 6. The percentage of gain or loss of the total average scores

The solid line represents the percentage gain in the average number of columns added by the experimental group over the control; the dash line, the percentage gain or loss in average positive scores; and the dotted line, the percentage gain or loss in average error scores. There was a rather consistent gain by the experimental group in the units of Series B, C, and D over the control in number of columns added and in positive score, the greatest gain being in the units of the 18-digit problems. Because of the great fluctuations in error scores resulting from the different instructions, the error score reductions in the units of Series C and D were approximately equaled by the increase in error scores on the units of Series B.

A comparison of the net positive scores (the error score subtracted from the positive) is interesting. These scores are given in Table VII. The curves in Figure 7 have been plotted from these data. An examination of the curves shows that efficiency, as measured by the net positive scores, was relatively little affected by the demands for speed, as the increase in error scores was approximately equal to the increase

in positive scores. The increased efficiency resulting from the demands for accuracy and speed and accuracy is, however, plainly shown by the upward trend of the curve for the experimental group in the units of Series C and D and the relative flatness of the curve for the control group in the units of these series.

TABLE VII. NET POSITIVE SCORES MADE BY THE EXPERIMENTAL AND CONTROL GROUPS

Series	Units	Experimental group	Control group
A	1–4–7	60.80	51.02
B	1–4–7	61.66	55.52
C	1–4–7	68.89	53.69
D	1–4	70.30	55.20
Average		65.41	53.86
A	2–5–8	25.66	21.67
B	2–5–8	28.36	25.84
C	2–5–8	35.30	27.04
D	2–5	35.03	28.07
Average		31.09	25.66
A	3–6–9	10.48	10.42
B	3–6–9	11.27	9.88
C	3–6–9	16.92	10.99
D	3–6	16.40	12.28
Average		13.77	10.89

The demands for speed, accuracy, and speed and accuracy slightly increased the number of columns added, the positive score, and the amount of work done. That this increase was not entirely affected by increase in errors is shown by the curves in Figure 7. It seems likely, however, that the increased efficiency of the experimental group over the control was due to the general motivating conditions aroused by the instructions rather than to the specific demands for speed, accuracy, and speed and accuracy. The instructions caused greater fluctuation in error scores than in the number of columns added, the positive scores, or the amount of work done.

These data would indicate that it is better to demand speed, accuracy, or speed and accuracy than to demand nothing at all. Of the three, the demands for accuracy and speed and accuracy produced the greatest increase in efficiency. There was little difference between the results of the demands for accuracy and for speed and accuracy.

A comparison of the number of first and second columns added correctly and incorrectly.—The number of first and second columns added correctly and incorrectly is given in Table VIII. The subjects were instructed to quit adding immediately on the command "Stop," and for

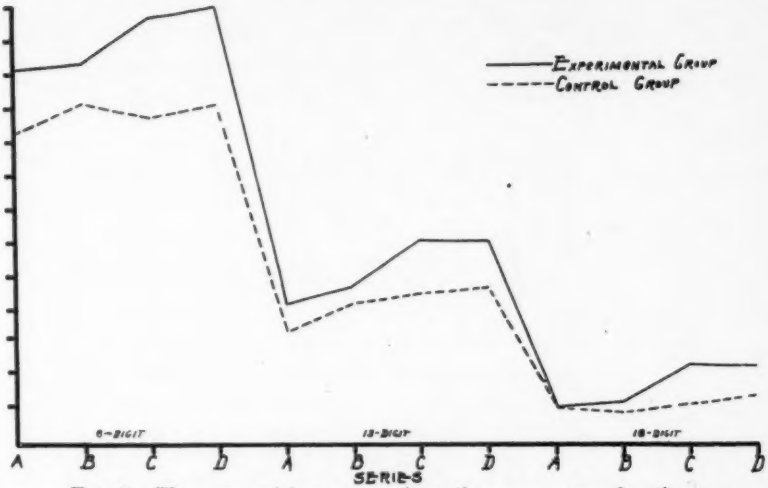

FIG. 7. The net positive score minus the error score for the control and experimental groups

this reason there were more first columns added than second columns. In the units of the 8-digit problems 93.54 per cent of the first columns were added correctly and 6.46 per cent were added incorrectly. For the second columns 89.67 per cent were added correctly and 10.33 per cent were added incorrectly. In the units of the 8-digit problems 3.87 per cent more second columns were added incorrectly than first columns. In the units of the 13-digit problems there were 12.56 per cent of first columns added incorrectly and 20.27 per cent of second columns added incorrectly. This was a difference of 7.71 per cent, more than twice the difference present in the units of the 8-digit problems. The percentage of difference between the first and second columns added incorrectly increased to 14.25 in the units of the 18-digit problems, which was approximately twice the difference existing in the units of the 13-digit problems. The longer the problems the greater the differences between the first and second columns added incorrectly.

The demands for speed decreased the percentage of first columns added correctly in the units of the 8-digit problems. The demand for accuracy and speed and accuracy in the units of the 13- and 18-digit problems tended to decrease the differences in number of first and second columns added correctly. The demands for speed, however, produced but little effect.

A comparison of the efficiency of the superior, average, and poor adders.—Two problems are involved in comparing the efficiency of the superior, average, and poor adders: (1) whether the length of the problems produced variations in efficiency between the three groups, and (2) whether the demands for speed, accuracy, and speed and accuracy produced different effects.

TABLE VIII. NUMBER OF FIRST AND SECOND COLUMNS ADDED CORRECTLY AND INCORRECTLY

Series	Units	First columns					Second columns					Difference in percentage between first and second columns added incorrectly
		Total number added	Correct		Incorrect		Total number added	Correct		Incorrect		
			Number	Per cent	Number	Per cent		Number	Per cent	Number	Per cent	
A	1–4–7	1986	1838	92.55	148	7.45	1941	1716	88.41	225	11.59	4.14
B	1–4–7	2146	1938	90.31	208	9.69	2108	1780	84.44	328	15.56	5.87
C	1–4–7	2053	1966	95.76	87	4.24	2012	1862	92.54	150	7.46	3.22
D	1–4	2074	1981	95.52	93	4.48	2040	1903	93.28	137	6.72	2.24
Average		2065	1931	93.54	134	6.47	2025	1815	89.67	210	10.33	3.87
A	2–5–8	1150	968	84.17	182	15.83	1082	821	75.88	261	24.12	8.29
B	2–5–8	1323	1111	83.98	212	16.02	1273	936	73.53	337	26.47	10.45
C	2–5–8	1210	1111	91.82	99	8.18	1149	1000	87.03	149	12.97	4.79
D	2–5	1304	1171	89.80	133	10.20	1244	1026	82.48	218	17.52	7.32
Average		1247	1090	87.44	157	12.56	1187	946	79.73	241	20.27	7.71
A	3–6–9	760	583	76.71	177	23.29	700	464	66.29	236	33.71	10.42
B	3–6–9	905	680	75.14	225	24.86	842	490	58.19	352	41.81	16.95
C	3–6–9	782	668	85.42	114	14.58	733	530	72.31	203	27.69	13.11
D	3–6	837	711	84.95	126	15.05	783	536	68.45	247	31.55	16.50
Average		821	661	80.56	161	19.45	765	505	66.31	260	33.69	14.25

TABLE IX. NET POSITIVE SCORES OF THE SUPERIOR, AVERAGE, AND POOR ADDERS

Series	Units	Superior	Average	Poor
A	1–4–7	95.30	65.70	26.00
B	1–4–7	90.80	64.00	23.00
C	1–4–7	95.40	74.70	39.30
D	1–4	95.50	76.40	35.20
Average		94.25	70.20	30.88
A	2–5–8	55.70	26.10	0.70
B	2–5–8	63.50	24.70	1.70
C	2–5–8	67.30	33.40	12.60
D	2–5	71.80	37.20	9.60
Average		64.58	30.35	6.15
A	3–6–9	26.90	12.60	—1.10
B	3–6–9	31.80	11.00	—4.60
C	3–6–9	32.40	17.20	3.70
D	3–6	33.70	11.80	1.20
Average		31.20	13.15	—0.20

To simplify the study of these problems the net positive scores (error scores subtracted from positive scores) of the 129 subjects of the experimental group, Series A, units 1, 4, and 7, were arranged in order from highest to lowest. The 12 subjects at the top of the distribution (superior), the 12 in the middle (average), and the 12 at the bottom (poor) of the distribution were selected. The average net positive scores of these subjects on the 33 units of the four series are given in Table IX. A comparison of the data, however, may be made more readily by examining the curves in Figure 8. The differences in efficiency existing in the initial performance of the three groups remained relatively constant throughout the 33 drill periods. The length of the problems and the demands for speed, accuracy, and speed and accuracy produced approximately the same effect on each of the three groups.

The methods of adding.—A study of the methods of adding practiced by the subjects of the experimental group showed that almost every conceivable method of combining digits was employed. The methods most frequently employed were: (1) simply adding digit to digit all the way up (or down) the column, never skipping digits to form combinations; (2) hunting for all the combinations of 10 (sometimes 5 and 15) and frequently placing the numbers at the side of the columns added; (3) using a familiar combination and adding or subtracting 1; and (4) doubling one number and adding or subtracting 1.

There was no uniformity in relation to adding upward or downward. Some subjects would add the first column upward and the second column downward. Others reversed the process. Some subjects uniformly added both columns upward; others uniformly downward. A

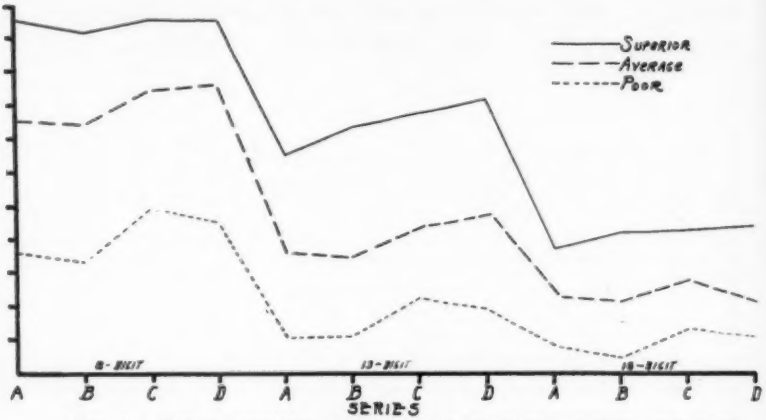

FIG. 8. The net positive scores of the superior, average, and poor adders

number of subjects sometimes added upward and sometimes downward.

There were two distinct methods used in "carrying": (1) placing the number to be carried at the top of the second column (occasionally at the bottom), and (2) beginning the combination of digits in the second column with the carried number.

In addition to the methods described there were a number of other interesting devices employed. Several subjects were "dot" adders. That is, they counted each digit by putting dots around it—:5̈:; a few placed their dots on the margin of the paper. There were a number of finger adders who counted each digit on their fingers. Two subjects counted the digits by tapping out the numbers with the toe of their shoe. There were a number of lip adders who counted sub-vocally.

In examining the methods of adding employed by the 12 subjects of the superior, average, and poor adder groups, it was found that the subjects comprising the group of superior adders were "sight" adders, adding digit to digit, without skipping for combinations, and that they did not write the carried number at the top or bottom of the second column but started adding the second column with the carried number. There was no uniformity, however, in upward or downward adding.

Each of the 12 subjects of the poor group employed some type of motor activity in adding. They were either pencil, finger, toe, or lip adders. The members of this group in practically all cases placed the "carried" number at the top of the second column. In general they added both columns upward and did much skipping to find familiar combinations.

The motor activity used most frequently by the subjects of the average group was lip movement. There was no uniformity in methods of carrying or in upward or downward adding. The members of this group used familiar combinations whenever they were convenient but they did not skip around as extensively as did the subjects of the poor group.

TABLE X. THE AVERAGE NUMBER OF COLUMNS ADDED, POSITIVE SCORES, ERROR SCORES, AMOUNT OF WORK DONE, AND THE NET POSITIVE SCORES MADE BY THE MEN AND WOMEN

Series	Units	Number of columns added		Average positive score		Average error score		Average amount of work done		Net positive score	
		Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
A	1–4–7	24.40	31.43	65.90	70.27	6.60	6.99	2.23	2.34	59	63
B	1–4–7	32.00	33.70	69.40	72.30	9.26	10.40	2.41	2.53	60	62
C	1–4–7	30.41	32.12	61.60	75.50	4.74	4.02	2.19	2.52	57	71
D	1–4	39.10	33.30	73.00	78.50	4.55	4.58	2.48	2.46	68	74
Average	.....	31.48	32.64	67.48	74.14	6.29	6.50	2.33	2.46	61	68
A	2–5–8	17.09	17.40	34.80	33.70	8.10	8.64	1.85	2.18	27	25
B	2–5–8	19.35	20.60	31.80	41.20	9.86	10.50	2.41	2.79	22	31
C	2–5–8	18.10	19.29	37.60	41.00	4.90	4.37	2.27	2.46	33	37
D	2–5	19.25	21.10	39.25	42.80	7.41	6.16	2.43	2.59	32	37
Average	.....	18.45	19.60	35.86	39.68	7.57	7.42	2.24	2.51	28	33
A	3–6–9	10.90	11.56	19.30	21.00	8.16	7.82	1.92	2.09	11	13
B	3–6–9	12.91	13.87	22.05	22.09	9.92	11.30	2.44	2.31	12	11
C	3–6–9	11.35	12.20	19.55	23.60	5.26	6.21	1.96	2.17	14	17
D	3–6	12.26	13.15	23.30	24.10	6.21	8.04	1.88	2.31	17	16
Average	.....	11.86	12.70	21.05	22.70	7.39	8.34	2.05	2.22	14	14

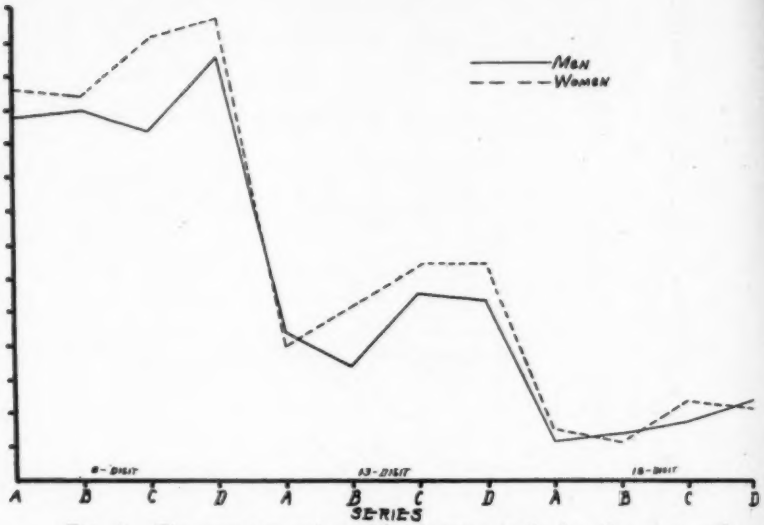

FIG. 9. The average net positive scores made by the men and women

The study of the methods of adding employed by the subjects of the superior, average, and poor groups indicates that the most efficient methods of adding are: (1) "sight" (no overt motor activity), (2) digit to digit (no skipping for familiar combinations), and (3) beginning the adding of the second column with the carried number (not written at the top or bottom of the column). Whether the individual adds upward or downward seems not to be important.

Sex differences.—The average number of columns added, positive scores, error scores, amount of work done, and net positive scores made by the men and women of the experimental group are given in Table X. In the number of columns added, positive scores, and amount of work done the women were on the average more efficient than the men. The degree of excellence of the women over the men was slight. In the units of the same length problems in the different series the differences were relatively constant, indicating that the demands for speed, accuracy, and speed and accuracy affected the performance of each group to approximately the same extent. The units of longer problems, however, tended to reduce the differences in efficiency between the men and women.

The average error scores for the men and women were approximately equal. In the units of the 8- and 18-digit problems the average error score of the men was slightly less than that of the women and in the units of the 13-digit problems the average error score of the men was slightly higher than that of the women.

The tendency for the longer problems to reduce the differences between the men and women is apparent when the net positive scores are examined. In the units of the 8-digit problems the average net positive score of the women was seven points higher than that of the men. This difference was reduced to four in the units of the 13-digit problems and there was no difference in the units of the 18-digit problems.

The curves in Figure 9 represent the average net positive scores made by the men and the women. The lines are more widely separated in the units of the 8-digit problems than in the units of the 13-digit problems. In the units of the 18-digit problems the curves cross and recross and are close together at all points. The variations resulting from the demands for speed, accuracy, and speed and accuracy in the different length problems are neither constant nor uniform. Apparently the length of the problems and the demands relative to speed and accuracy affected the efficiency of both the men and the women in approximately the same way and to the same extent.

The relation of ability to adding efficiency.—The 129 subjects of the experimental group were divided into four groups according to their percentile ratings.[1] The lowest ability group consisted of those subjects with a percentile rating of from 1 to 25, the second group of from 26 to 50, the third group of from 51 to 76, and the highest ability group

TABLE XI. DISTRIBUTION OF POSITIVE SCORES IN RELATION TO THE PERCENTILE RATINGS OF THE SUBJECTS

Percentile rating		1–25	26–50	51–75	76–100
Average		11.27	37.00	63.40	87.67
Series	Units				
A	1–4–7	55.13	69.40	72.38	81.16
B	1–4–7	59.30	76.51	73.62	82.20
C	1–4–7	61.62	79.44	76.25	83.48
D	1–4	63.02	79.12	80.90	87.12
Average		59.77	76.12	75.79	83.49
A	2–5–8	26.06	35.71	37.47	43.52
B	2–5–8	27.80	41.23	44.00	51.76
C	2–5–8	33.06	42.06	40.19	50.92
D	2–5	31.61	44.14	49.00	54.83
Average		29.63	40.79	42.67	50.26
A	3–6–9	16.51	20.03	22.00	25.52
B	3–6–9	15.89	24.13	25.43	29.92
C	3–6–9	17.70	23.61	24.72	28.16
D	3–6	17.11	24.53	25.40	31.63
Average		16.80	23.08	24.39	28.81

[1]Ability was based on the percentile ratings made on the Psychological Examination for High School Graduates and College Freshmen, prepared by L. L. and T. G. Thurstone, published by the American Council on Education.

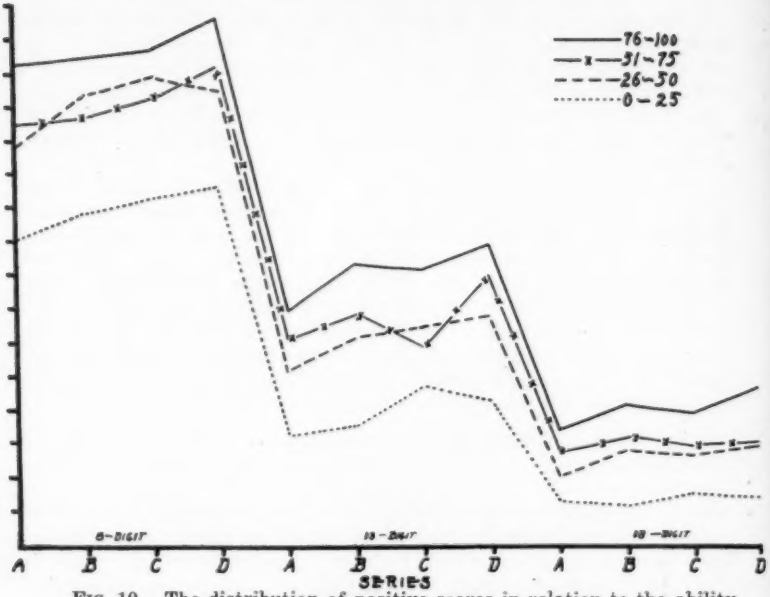

FIG. 10. The distribution of positive scores in relation to the ability of the subjects

of from 76 to 100. The average positive scores for the subjects in each of the four ability groups are given in Table XI. In the units of the 8-digit problems the average positive score of the lowest ability group was 59.77; of the next highest, 76.12; of the next, 75.79; and of the highest ability group, 83.49. The highest group average was approximately as far above the two middle groups as the score of the low ability group was below. The same general relationship persisted in the units of the 13- and 18-digit problems.

The curves in Figure 10 show that in general the efficiency of the four groups was affected in the same manner and to the same extent by the length of the problems and the demands for speed, accuracy, and speed and accuracy. Ability as measured in this study is an important factor in adding efficiency, especially so when the efficiency of the high and low ability groups are compared.

SUMMARY AND CONCLUSIONS

In order to determine the factors affecting efficiency in addition, an unselected group of 158 college students, 129 in the experimental group and 29 in the control group, was given 33 five-minute drill periods on 33 units of addition problems. Each unit of problems consisted of 20 two-column problems. There were 11 units of problems 8 digits high, 11 units 13 digits high, and 11 units 18 digits high. The 33 units of problems were divided into Series A, B, C, and D, with 9 units in each of Series A, B, and C and 6 units in Series D. The specific instructions

for the units of each of the four series for the subjects of the experimental group were:

Series A. No instructions in relation to speed and accuracy.
Series B. Add as rapidly as possible. Give no consideration to accuracy.
Series C. Be accurate. Give no consideration to speed.
Series D. Add rapidly but be accurate.

The experimental conditions for the control group were exactly the same as those for the experimental group except that there were no instructions concerning speed and accuracy for any of the units of problems in any of the series.

The important conclusions of the analysis are as follows:

1. There were marked individual differences in adding efficiency. This would indicate the need for diversified methods of teaching and individual instruction in addition.

2. There was a slight tendency for individual differences to increase in the units of the 13-digit problems but there was no further tendency for individual differences to increase in the units of the 18-digit problems. The length of the problems best suited for individual drill should be selected in relation to the adding efficiency of the individual.

3. The demands for speed, accuracy, and speed and accuracy produced marked variations in the error scores of the poor adders but only slightly affected the superior adders. In number of columns added, positive scores, and amount of work done, little effect was noted. .

4. Rote drill consisting of 33 five-minute drill periods produced but slight improvement in adding efficiency. Under the conditions of this study rote drill in addition is largely a waste of time and should be discontinued.

5. Increase in length of problems did not increase error scores. Error scores were probably due to the inability to make certain combinations correctly.

6. The reduction in average number of columns added with increase in length of problems was greater than the proportional increase in number of digits. The correct length of problems for drill purposes should be carefully determined, since problems which are too long tend to slow down the speed of combining digits.

7. The demands for speed, accuracy, and speed and accuracy increased adding efficiency. Of the three, the demands for accuracy and for speed and accuracy produced the greatest increase in efficiency. In drill in addition it is better to demand speed, accuracy, or speed and accuracy than to demand nothing at all.

8. The percentage of second columns added incorrectly was considerably higher than the percentage of first columns added incorrectly. The longer the problems the greater the difference between the number of first and second columns added correctly.

9. A comparison of the efficiency of the superior, average, and poor adders showed that the difference in efficiency existing in the initial

performance of the three groups remained relatively constant throughout the 33 drill periods. The length of the problems and the demands for speed, accuracy, and speed and accuracy produced approximately the same effect on each of the three groups. Diagnostic investigation of the poor adders and individual instruction seem to be needed.

10. The most efficient methods of adding were (*a*) "sight" (no overt motor activity), (*b*) digit to digit (no skipping for familiar combinations), and (*c*) beginning the adding of the second column with the carried number. Whether the individual added upward or downward seemed not to be important. In the teaching of addition greater emphasis should be placed on methods.

11. No marked sex differences in adding efficiency were found.

12. General intelligence as measured in this study is an important factor in adding efficiency, especially so when the efficiency of the high and low ability groups are compared. Apparently the present methods of teaching addition are not suitable for the low ability individuals.

BIBLIOGRAPHY

1. Beers, George Amos. *Tests of Various Methods of Drill in Commercial Arithmetic.* Unpublished Master's thesis. Department of Education, University of Chicago, 1913. 28 pp.
2. Bowden, A. O. *Consumer's Uses of Arithmetic.* Contributions to Education No. 340, Teachers College, Columbia University, New York, 1929. 69 pp.
3. Brown, Joseph C. "An Investigation on the Value of Drill Work in the Fundamental Operations of Arithmetic." *Journal of Educational Psychology* 2:81-8, February, 1911; 3:485-92, November, 1912; 561-70, December, 1912.
4. Buswell, G. T. "Summary of Arithmetic Investigations." *Elementary School Journal* 26:692-703, May, 1926; 745-58, June, 1926; 27:685-94, May, 1927; 731-44, June, 1927; 28:702-9, May, 1928; 730-42, June, 1928.
5. Buswell, G. T., and Judd, C. H. *Summary of Educational Investigations Relating to Arithmetic.* University of Chicago Press, Chicago, 1925. 212 pp.
6. Counts, G. S. *Arithmetic Tests and Studies in the Psychology of Arithmetic.* University of Chicago Press, Chicago, 1917. 127 pp.
7. Judd, Charles H. *Psychological Analysis of the Fundamentals of Arithmetic.* University of Chicago Press, Chicago, 1927. 121 pp.
8. *The Twenty-ninth Yearbook of the National Society for the Study of Education.* Edited by Guy Montrose Whipple. Public School Publishing Company, Bloomington, Ill., 1930. 749 pp.
9. Scott, William. "Errors in Arithmetic." *Journal of Experimental Pedagogy* 3:296-307, June 5, 1916; 4:147-9, December 5, 1917.
10. Wechsler, David. *The Range of Human Capacities.* The Williams and Wilkins Company, Baltimore, 1935. 159 pp.

The Superintendent's Appraisal of Teacher Candidates

H. B. ALLMAN, Superintendent of Schools, Muncie

A STUDY which aims to sample only current practice in order to determine some of the opinions and standards which guide superintendents of schools in evaluating the relative suitability of candidates for teaching positions will, no doubt, go forever unheralded and unsung as a contribution to objective science. It is an indisputable fact, however, that the judgments (or perhaps you may call them biases) of superintendents are of paramount importance to the applicant for a teaching position. The success or failure of the prospective teacher in securing appointment may rest upon them.

The present study makes no pretense of evaluating these opinions and standards, nor does it attempt to justify their use. Its purpose is to discover them and to observe the extent to which superintendents agree as to their importance. With this end in view, and with the hope that a recognition of these factors may enable students in training to meet the standards which superintendents regard as significant, a questionnaire was prepared and mailed to approximately 500 superintendents in California, Georgia, Illinois, Indiana, Iowa, Michigan, Missouri, Nebraska, New York, Ohio, Pennsylvania, and Wisconsin. In content and arrangement the questionnaire followed rather closely similar studies conducted by Institutional Teacher Placement Association groups in Minnesota and California.

The first group of factors relates more or less definitely to personal and professional traits of the candidate for a teaching position. These traits include training, experience, age, sex, scholarship, residence, marital status, citizenship, religious affiliation, socio-economic background, and social interests. The second group of factors relates to the requirements of particular localities which specify the activities, the services, and the policies of the superintendent and his board of trustees. The third group deals with procedure and includes the steps taken in filling a position, application procedure, the ratio of beginning to experienced teachers, and the types of placement services used last year. In the fourth division, superintendents are asked to list ways in which institutional placement services might serve the needs of superintendents to a better advantage. Finally, superintendents are asked to rate a list of 34 qualities that are thought to be desirable for teachers to possess.

In interpreting the answers of superintendents no effort has been made either to justify or to condemn their reactions. These answers mean whatever they mean to you. Superintendents have to be taken as they are rather than as you think they should be. Personally, I have found much satisfaction in discovering the trends revealed by a tabulation of their answers.

The 290 questionnaires were classified into four groups on the basis of population.

The first group, containing 100 questionnaires, includes cities below 1,000 population. The second group, of 158, ranges from 1,000 to 4,999. The third group, of 20, ranges from 5,000 to 9,999. The fourth group, containing 12 questionnaires, ranges from 10,000 up.

The tabulation of the answers relating to training as shown in Table I illustrates effectively how theory outruns practice. In expressing their preference for duration of training, superintendents set progressively higher standards for elementary, junior high school, and senior high school teachers. As you will find expressed by the medians of Table I, the superintendents believe that elementary teachers should have 4.0 years of training, that junior high school teachers should have 4.6, and that senior high school teachers should have 5.2 years of training. When asked to express what they actually require, these same superintendents reveal standards that are somewhat lower. The median training in terms of years is, for elementary 2.7, for junior high school 4.4, and for senior high school 4.5. It is interesting to note that, although these reactions were obtained before the Indiana State Board of Education announced a four-year training curriculum for elementary teachers, the preferences of superintendents are in keeping with the new standard.

TABLE I. LENGTH OF TRAINING OF TEACHING CANDIDATES ABOVE HIGH SCHOOL

Years of training	Preference			Requirement		
	For elementary candidates	For junior high school candidates	For senior high school candidates	For elementary candidates	For junior high school candidates	For senior high school candidates
6			2			
5		36	173		3	12
4	101	230	109	43	192	261
3	49	4		35	31	
2	35	3		197	28	1
1				1		
Total	185	273	284	276	254	274
Median	4.0	4.6	5.2	2.7	4.4	4.5

College degrees are not required generally for elementary teachers but are regarded as necessary for junior high school and senior high school appointments. Only 41 superintendents require elementary teachers to have a college degree, while 247 do not. For junior high school teachers, 189 require a degree and 70 do not; and for senior high school teachers 278 require a degree and only 7 do not. The trend toward a longer period of training for all teachers has been very marked during the past quarter of a century. It seems quite likely to continue until teaching rates with other professions. This development seems to indicate that teaching will not long remain the doorstep or stepping-stone to other professions. It is becoming worthy in its own right.

Teaching experience prior to appointment is not required by 198 of the 290 superintendents. There is an encouraging tendency to accept inexperienced candidates. In Table II you will note that as training standards have increased, experience requirements have decreased or disappeared altogether. Superintendents are freely stating that well-trained beginners often are more desirable than experienced teachers with less training. The experience fetish seems to be, in part, a holdover from days when no definite standards of training were required. Two years is the amount of experience most frequently required, as well as the amount most frequently preferred, for each level of service.

TABLE II. EXPERIENCE OF TEACHING CANDIDATES

Years	Preference			Requirement*
	For elementary candidates	For junior high school candidates	For senior high school candidates	
Above 8.....	3	3	5	..
8.....	1	1	2	..
7.....	1	..	1	..
6.....	1	..	2	..
5.....	23	24	38	3
4.....	16	20	24	..
3.....	45	47	47	8
2.....	131	104	104	51
1.....	13	13	9	30
Total.....	234	212	232	92
Median.....	2.8	2.9	3.1	2.3

*The exceptions to this requirement, together with the number giving each exception, are as follows: unusually promising persons, 20; applicants from local high school graduating class, 13; special subject candidates, 12; college recommendations (unusual records), 8; if candidate has had training school experience in chosen field, special practice, etc., 4; short supply of teachers, 4; emergencies, 3; rural one- and two-room schools, 2; two year probationary appointments to help in teacher training, 2; substitute teachers, 2; if a question of discipline, 1; part-time teacher working under another teacher, 1; personal reasons, 1; five-year graduate, 1; mature teachers working toward a degree, 1; and request of school board, 1.

The age of the candidate was regarded as important by 194 of the superintendents; 42 regarded it as unimportant; and 20 held it to be of minor or limited importance. Those who held it to be of no or little importance gave the following types of reason: "desirable to have a cross-section of age levels"; "prefer a balanced staff—some beginning—some older"; "no limits save excessive youth"; "we naturally get young people"; "well-trained experienced persons cannot be procured at our salaries, hence we prefer younger people without experience but with as much training as possible."

According to Table III the age range for appointment cited most frequently was 20 to 40. This holds true for all three levels—elementary, junior high, and senior high school. There is a tendency to raise the

lower age limit to 22 or 24. The number indicating 60 as an upper limit increases progressively from elementary to senior high school levels. The most frequent age range for the appointment of principals is from 24 to 40. There is a marked tendency to raise the lower limit to 30 years and the upper limit to 50 or even 60 years. No observable difference in age limitation in relation to sex is noted. When superintendents express preferences there is observed a tendency to narrow the range of ages by raising the lower limit to 24 and lowering the upper limit to 30. The most frequently preferred upper range remains at 40 for senior high school teachers and for principals. When asked if exceptions were made 178 answered "yes," 17 "no," and 16 "rarely." The reasons given for making exceptions are listed in Table III.

Opinions were evenly divided on the question of appointing candidates with less than average record. Of those who answered this question, 126 said "yes" and 128 said "no." Reasons for the "yes" answers are as follows: good personality, attitude, character, hard worker, industrious, willing to learn, 45; when no others are available, 33; local pressures, citizen and board demands, 21; training record low, but experience record good, 17; when candidate shows capacity for development, 8; special position for which candidate shows a special aptitude, 5; knowing certain conditions responsible for inferiority, 4; and if student had to work, desperate need, 3.

Preferences for breadth of training for secondary school teachers revealed that superintendents prefer teachers with three or more teaching subjects according in Table IV. There were 227 who preferred teachers with three licenses or three teaching subjects, while only 77 preferred those with less than three licenses. These responses seem to indicate rather conclusively that students preparing to teach should so plan their courses that license requirements may be met in three or more subject-matter fields. Schools of education and teachers colleges have planned curricula that meet this demand. In many institutions the requirements for the A.B. degree are so narrow and limiting that it is difficult for students to meet license requirements in two subject-matter fields and next to impossible for even the strongest students to obtain licenses in three or more fields. Efficient and well-planned guidance service should make clear to students preparing for teaching positions the advantage of a broader license requirement. They should be directed into courses that are less restricting. The advent of a five-year training requirement for secondary teachers may simplify somewhat this difficult problem.

Superintendents are not provincial in the selection of their teachers. In Table V, 254 indicate that they accept candidates from outside the state if the candidate is eligible for a license within the state where appointment is to be made, while 22 do not accept them. The question of the "local" *versus* the "non-local" teacher usually elicits more than passive interest. It seems to be a moot question. This study offers no conclusive answer. A local teacher is defined as a graduate or a product of the local school system. Preferential opinions range all the way from no local teachers to all local teachers. Of the 161 who answered

TABLE III. AGE LIMITS WITHIN WHICH CANDIDATES ARE CONSIDERED AND PREFERRED*

Lower age limits in years	Upper age limits in years																													
	Elementary candidates								Junior high school candidates								Senior high school candidates								Candidates for principal							
	30		40		50		60		30		40		50		60		30		40		50		60		30		40		50		60	
	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W
Considered†—																																
20 and below	56	53	63	81	28	31	25	25	22	32	52	52	34	34	10	11	15	15	39	48	35	29	10	13	2	2	3	3	7	5	3	2
22	7	9	19	22	11	9	6	8	6	6	29	43	16	12	2	3	6	6	24	29	24	19	18	19	...	1	2	3	3	2	1	...
24	...	...	14	8	1	...	9	3	2	2	23	23	8	3	6	4	2	2	39	41	13	8	14	9	3	2	43	44	31	27	23	16
26	...	...	...	...	...	...	...	...	...	...	1	1	1	1	...	...	...	...	1	1	...	...	1	1	...	...	4	4	3	2	3	2
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10	8	6	4	2	3
30 or above	...	...	...	...	...	...	...	...	...	...	1	...	1	...	3	2	...	...	1	1	...	...	3	4	...	...	18	23	32	19	27	23
Preferred—																																
20 and below	69	68	31	42	6	9	11	15	26	30	22	33	6	6	6	5	16	17	20	24	7	8	7	8	1	1	13	9	4	3	3	1
22	25	20	16	19	3	4	3	4	23	24	19	21	6	5	3	3	18	22	18	22	8	7	7	7	1	2	2	3	1	...	...	...
24	10	9	23	20	4	3	9	11	16	27	38	35	8	8	1	2	20	20	61	54	13	10	17	15	9	10	47	46	19	15	15	11
26	...	...	...	...	...	...	...	...	...	...	1	1	1	1	1	1	...	...	1	1	1	1	1	...	1	1	7	7	...	...	1	...
28	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	2	1	...	...	8	6	4	2	1	1
30 or above	...	...	2	1	3	1	5	5	...	...	3	1	3	...	2	2	...	...	3	3	2	2	5	5	...	...	29	26	30	20	20	19

*Read as follows: of those reporting, 56 systems consider men applicants between 20 and 30 years of age for elementary school positions; 53 consider women between 20 and 30; 63 consider men between 20 and 40; 19 consider men between 22 and 40; etc.

†Reasons for making exceptions to the age limits indicated, together with the number listing each reason, are as follows: personality, training, experience, kind of position, exceptional candidate, growth, 89; local residence, service in local schools, 15; peculiar situations, 11; merit fitness for positions, 9; necessity, emergency, availability, 7; unusual record, 4; preference of school board, local conditions, 3; special subjects (few teachers), 2; and others, 8.

TABLE IV. PREFERENCE AS TO MAJORS AND MINORS OF SECONDARY SCHOOL TEACHERS

Majors and minors	Number
One major and two minors	106
Two majors and one minor	91
One major and one minor	44
One major and three minors	30
Two majors only	30
Other combinations	3

this question 60 preferred a 1 to 1 ratio; 68 preferred fewer local than non-local; while 33 preferred more local than non-local teachers. The ratio with the highest frequency is one local to three non-local teachers.

TABLE V. PREFERRED RATIO OF LOCAL TO NON-LOCAL TEACHERS

Group	Ratio	Number	Total
Local	50:50	60	60
More local than non-local	100:0	2	..
	75:25	14	..
	10:3	2	..
	2:1	3	..
	60:40	12	33
Fewer local than non-local	35:65	4	..
	1:2	10	..
	1:3	21	..
	30:70	3	..
	2:5	2	..
	1:4	7	..
	1:5	4	..
	1:10	3	..
	1:9	11	..
	0:100	3	68
Total	.....	.....	161

Another of the debatable questions is whether married women should be appointed to teaching positions. The phase of the study which is designed to determine the ratios of married men to married women now on the faculties of the schools represented was practically fruitless. The present policy of appointment is very definitely and decisively against the married woman. Of the superintendents who answered this question, 214 said that they would not appoint married women. Only 38 said that married women would be considered for appointment. The others indicated an occasional appointment of married

women in cases where no unmarried candidates were available. A rather decided preference was shown for married men over single men —167 answered "yes" and 78 "no." Other answers indicate no preference except for administrative positions. Married men are preferred for these. However, there seems to be no disposition to discriminate against the unmarried man in competition with the married man.

Do superintendents prefer that candidates have some religious affiliations? To this question 250 superintendents answer "yes," and only 33 say "no." Yet 197 claim that there would be no discrimination against a non-church member, 59 would discriminate, and 16 others would do so "sometimes." There seems to be a very little tendency to show preference for any denomination (23 as against 256 who would not show preference), although the answers indicate some prejudice against Greek Catholic, Roman Catholic, and Jewish churches. It seems to be to the advantage of a candidate to have membership in some church represented in the community. Adherents to faiths maintaining their own parochial school systems may expect to meet some prejudice in seeking teaching positions in the public schools. This prejudice seems to be disappearing somewhat but still remains as an important factor. Table VI shows the attitude of superintendents toward the religious affiliation of candidates.

TABLE VI. ATTITUDE OF SUPERINTENDENTS TOWARD THE RELIGIOUS AFFILIATION OF CANDIDATES

Denomination	Little or no influence	Probable rejection	Almost certain rejection
Member of no church	49	43	18
Greek Catholic	28	46	57
Roman Catholic	32	53	46
Unitarian	63	18	3
Jewish	29	59	39
Lutheran	74	4	..
Methodist	79	..	..
Christian Science	68	18	6
Presbyterian	81	..	..
Baptist	81	..	..
Congregational	79	..	..

Almost without exception candidates for teaching positions are expected to be citizens of the United States. Although you find no summary among the votes, the affirmative answers were 253 as compared to 7 negative. There were 6 who had no rule. Exceptions were indicated as follows: "exchange teachers," "persons who had already filed intention to become citizens," "instruction in languages or special fields," "have two Canadians." It is interesting to note in this connection that teachers have generally resented being compelled to take an oath of allegiance or to swear that they have not taught theories

subversive to the best interests of the government. This contention might well be regarded as "much-ado-about-nothing." The oaths seem harmless enough practically to eliminate objection to them. On the other hand, it seems doubtful whether such oaths afford any protection to the country. It is likely that loyalty oaths create more problems than they solve.

Candidates from small communities and rural areas are preferred over candidates from larger cities. This preference is indicated by 148 of the answers. The rural background of superintendents of schools may be responsible for their biases on this point.

Membership in Greek letter fraternities seems to be of no advantage to candidates, although activity in dramatics and departmental and church clubs is valued highly. This summary is given in Table VII.

TABLE VII. SPECIAL CONSIDERATION GIVEN TO CANDIDATES BELONGING TO CLUBS

Type of organization	Number giving consideration	Number giving no consideration
Social (Greek Letter) societies	5	66
Departmental clubs	38	21
Dramatic clubs	58	4
Church clubs	36	26

Interest in and active sponsorship of extracurricular activities is demanded in all modern school systems. In Table VIII, showing 22 activities arranged by frequency of mention, chorus heads the list with dramatics, school assemblies, athletic teams, band, and school publications following closely. Every teacher should look forward to participation in the extracurricular program.

In the field of teams and competitive sports 47 separate activities were listed. Many of these were mentioned by one or two schools only. The sports that seemed most popular are given in Table IX.

Teachers in non-language positions are not required to speak a foreign language, and candidates who are to teach language have almost an even chance to get a position without ability to speak the language to be taught. Of the superintendents reporting, 105 expect their language teachers to be able to speak the language that they teach, while 124 do not. The relatively high prevalence of Latin probably accounts for the low requirement for speaking ability.

Study abroad is encouraged in 145 cases but is not in 106. Special consideration is given to those who study abroad in 99 school systems, but it is not given in 93 schools.

Most of the schools have no established tenure policy except that required by state laws. Only 89 schools have such a policy, while 160 do not.

TABLE VIII. EXTRACURRICULAR ACTIVITIES CARRIED

Activity	Below 1,000	1,000-4,999	5,000-9,999	10,000 and above	Total
Chorus	101	156	20	12	289
Dramatics	92	142	20	11	265
Assemblies	91	140	19	10	260
Athletic coaching	90	139	17	11	257
Band	80	138	19	12	249
School publications	78	139	20	12	249
School clubs	76	143	19	11	249
Gymnastics	84	126	17	10	237
Debating	66	130	19	11	226
Parent-teacher activity	56	132	17	10	215
Orchestra	86	79	20	12	197
Rhythm and dances	57	94	15	9	175
School publicity	62	83	14	9	168
Pupil participation in government	52	89	11	9	161
Curriculum planning	49	73	12	11	145
Piano	40	61	10	8	119
Civic organization	35	56	11	10	112
Public address	41	49	10	10	110
Camping	21	36	7	6	70
Playground activities	..	29	16	10	55
4-H Club	3	2	..	..	5
Archery	3	1	..	..	4

TABLE IX. SPORTS IN WHICH SCHOOLS HAVE COMPETITIVE TEAMS*

Sport	Number having teams
Basketball	264
Baseball	157
Track	154
Football	150
Tennis	80
Golf	47
Softball	24
Swimming	18
Wrestling	13
Volley ball	11
Soccer or hockey	10
Cross country	8

*Other sports mentioned and the number of schools having participating teams were as follows: field 6, debate 5, bowling 3, athletics 3, playground ball 3, hardball 2, gym 2, archery 2; and each of the following was mentioned by one system: boxing, ping pong, touch football, horseshoe, girls' basketball, girls' tennis, and girls' hockey.

An effort was made to determine the influence that certain personal habits and social attitudes of the candidates might have on the superintendent's recommendation. The questions were framed in a manner to determine whether there is evidence of a double standard for men and women. The results are given in Table X. Participation in party politics, the use of liquor, the use of tobacco, and non-church attendance are items that receive relatively important attention in the appointment of both men and women. The vote would indicate that men are allowed a little more freedom than women. The overuse of cosmetics is regarded as quite objectionable. No use of cosmetics is regarded by 13 superintendents as justfication for rejection. The answer seems to be moderation in all things. Little significance is attached to dancing and card playing.

TABLE X. PRACTICES AFFECTING SELECTION OF MEN AND WOMEN TEACHERS

Practices	Below 1,000		1,000-4,999		5,000-9,999		10,000 and above		Total	
	1*	2*	1	2	1	2	1	2	1	2
MEN—										
Use of liquor	31	68	26	112	3	16	6	4	66	200
Participation in politics	36	9	60	16	12	1	2	1	110	27
Use of tobacco	16	7	41	5	4	..	1	..	62	12
Non-church attendance	25	3	27	2	1	1	..	..	53	6
Dancing	3	..	5	..	1	..	..	..	9	...
Playing cards	3	..	2	..	1	..	..	..	6	...
Abstinence from tobacco	..	..	..	..	..	..	..	..	..	...
Inability to dance	..	..	..	..	..	..	..	..	..	...
Inability to play cards	..	..	..	..	..	..	..	..	..	...
WOMEN—										
Use of liquor	26	73	23	116	2	17	6	4	57	210
Use of tobacco	43	33	55	44	9	4	3	..	110	81
Over-use of cosmetics	51	9	73	18	15	1	5	..	144	28
Participation in politics	37	11	57	17	13	..	3	..	109	29
Non-church attendance	24	3	27	2	1	..	..	..	52	5
No use of cosmetics	5	..	7	..	1	..	..	..	13	...
Dancing	5	..	5	..	1	..	..	..	11	...
Playing cards	3	..	2	..	1	..	..	..	6	...
Inability to play cards	..	..	1	..	..	..	..	..	1	...
Moderate use of cosmetics	..	..	..	..	1	..	..	..	1	...
Abstinence from tobacco	..	..	..	..	..	..	..	..	..	...
Inability to dance	..	..	..	..	..	..	..	..	..	...

*Column 1 means probable rejection. Column 2 means certain rejection.

Superintendents were asked to list physical disabilities that would cause rejection of the candidate. An extended list was obtained. These are grouped in Table XI into a few types.

TABLE XI. PHYSICAL DEFECTS THAT SHOULD CAUSE REJECTION OF CANDIDATES

Defect	Number mentioning defect
Crippled beyond ability to carry out necessary activities, lack of limb, etc.	124
Deformity, grave physical handicap, cross-eyes, noticeable defects	114
Deafness (major), poor hearing	111
Defective eye-sight (major)	110
General poor health, lack of vigor, organic disease, cancer, tuberculosis, social disease, chronic disease, heart disease, etc.	83
Speech defects, stammering, stuttering, muteness, etc.	49
Anything that would adversely affect the emotional life of children (anything repulsive)	32
Inability to pass physical examination	20
Unusual undersize or oversize	10
Objectional birth marks	4

Students are always very anxious to know the application procedure followed or favored by superintendents. The questionnaire requested the superintendent to state the first step in his procedure for seeking desirable candidates. The order of preference, the procedure, and the party to whom the applicant should apply are shown in Tables XII to XIV. Eighteen superintendents stated that they applied first to a com-

TABLE XII. FIRST STEP IN APPLICATION PROCEDURE

First step*	Number
Consult college or university placement bureau	105
Check files	42
Have personal interview	16
Study credentials—educational and experience data	11
Determine kind of teacher needed to fill position	10
Notify institutional and commercial agencies	10
Notify an agency	8
Check reserve applications; apply to agency or institutions	5
Check local candidates available	5
Ask for applicants	3
Ask for letter of application in candidate's handwriting	2
Ask for letter of application, personal interview	2
Observe applicant if possible	2

*Each of the following items was listed by one superintendent: study questionnaire, then have personal interview; make decision as to subject placement; consult universities and men I know; get in touch with three excellent candidates; depends upon the vacancy; check county list, college placement, agencies; look over college record, teaching experience and success; advertise, ask for interview then request transcript; consult our own teachers' association; consult county office; provide all candidates with application form; meet candidate personally; interview applicant incognito; analyze papers and see photograph; consult state department then college placement; report to committee; get recommendations and letters from former employers; engage applicant in general conversation; visit or interview applicant; consult state department; have candidates meet our Eligibility Committee.

mercial agency; 217 to an institutional agency; and 19 to both types of agency. In describing the application procedure desired, the superintendents favor having the candidate come for a personal interview following the examination of a written application and credentials which he is asked to fill out and submit. Application should be made to the superintendent.

TABLE XIII. APPLICATION PROCEDURE DESIRED

Procedure*	Number
Hold interview following a written application	69
Hold interview with superintendent	43
Fill out an application form	28
Ask for a letter, followed in selected cases by an interview	13
Get statement of credentials from bureau	11
Secure information on candidate, then interview	10
Ask for a letter written by the applicant	9
Hold a personal interview, followed by written application and credentials	6
Study credentials first	6
Have two or three applicants recommended by the institution to come for an interview	5
Hold an interview when requested	4
Follow no definite procedure	4
Hold an interview and study record	2

*Each of the following procedures was listed by one superintendent: have a personal interview and ask for recommendations from people I know; ask for a written application followed by a personal application on request; select from folders, then from approved list; file applications, then ask a select group to apply in person; get a letter from candidate, then make a personal visit to institution from which he is to be graduated or to school where he is teaching; would like for institutions to recommend graduates in the field; study records and references, ask for personal application, and select groups to be sent to the Teachers Committee of the Board of Education for interview; write or make a personal call, or applicant knowing of vacancy may apply; ask for longhand letter of application, questionnaire, interview, investigation by principal; request formal application, statement from institution, and personal visits; have personal interview with persons who know candidate; study credentials of three or four available and qualified teachers; interview the applicant and get direct information from references; visit practice teachers, secure available information; request written application and interview, and observe teaching; request papers and photograph; request written application in longhand; visit districts where good teachers work; visit applicants.

TABLE XIV. PARTY TO WHOM APPLICANT SHOULD APPLY

Party*	Number
Superintendent	218
County superintendent and trustee (also or trustee)	20
School board and superintendent (also or superintendent)	9
Superintendent and principal (also or principal)	5
Supervising principal	4
Principal	3
Trustee, principal, board, or super ntendent	2

*Others, listed by one superintendent each, are as follows: superintendent or principal who is filling the position; the person who recommends the candidate for appointment; the principal who is the district superintendent; the board or principal; the secretary; the trustee, principal, and superintendent; the employing official; the principal or trustee; the superintendent or secretary of the school board.

The per cent of newly prepared teachers that can be assimilated is set forth in Table XV. The fact that a large proportion of the superintendents agreed on 5 per cent of inexperienced teachers helps to verify a statement made earlier in this study. City school systems are adopting the view that a limited proportion of good beginners can be absorbed successfully each year.

TABLE XV. PER CENT OF NEWLY PREPARED TEACHERS THAT CAN BE ASSIMILATED EACH YEAR

Per cent	Below 1,000	1,000-4,999	5,000-9,999	10,000 and above	Total
1	7	11	..	1	19
2	9	13	1	4	27
3	4	13	3	1	21
5	34	55	9	4	102
Higher	33	34	7	2	76

These superintendents were asked to report the number of teachers employed through each of three sources. Table XVI gives the results. (1) Institutional Teacher Placement Bureaus were used by 211 superintendents. (2) Placement services of state department were called upon by 52 superintendents. (3) Commercial agencies were used in 116 cases. Superintendents seem to be developing the correct and commendable habit of turning to training institutions first and giving them the first opportunity to fill the position. The relationship between the

TABLE XVI. NUMBER OF TEACHERS EMPLOYED IN 1935-36

Number of teachers employed	Number of systems using agency		
	Institutional agency	State department	Commercial agency
None	9	66	54
1	42	29	57
2	43	16	27
3	32	3	11
4	22	2	7
5	24	..	5
6	9	1	1
7	5	..	5
8	6	..	..
9	2	..	1
10	6	..	..
Above 10	20	..	2
Total	211	51	116

employing official and the institutional placement service is mutually coöperative. The training institution is under obligation to provide accurate, complete, prompt, and courteous service when called upon to recommend candidates. Superintendents should in turn provide the placement official promptly with accurate and complete information concerning the requirements of the position and the conditions and terms of the proposed contract. He should be courteous and considerate of the candidates who apply to him on the suggestion of the placement service.

Both in recommendation and in the employment of teachers, distinctions must be drawn among candidates. An effort should be made to preserve the confidence and self-respect of the unsuccessful candidate. Lessons of courtesy and consideration may well be learned both by placement services and by employing officials.

Each superintendent was asked to state specific ways in which the institutional and state department placement bureaus might serve the needs to a better advantage. One hundred fifty-nine separate suggestions were made. Each of these is helpful but it would be impossible to present them in detail. They have been classified into nine types of changes or improvements. A brief comment on each type follows:

1. **Present situation.**—A number of the superintendents indicate that institution placement services have been improving; they are grateful for the efficient help that training institutions are giving them.

2. **Enrollees.**—There seem to be two rather distinct viewpoints in regard to the enrollment of students for the placement service. Some hold that no person who has less than an average record should be permitted to enroll. They offer such expressions as "list only the best," "refuse to graduate mediocre students," "refuse to sponsor weak teachers," and "recommend best only."

Others contend that every student should be required to enroll with the placement office. This plan would not only include all at graduation but would continue them on the active rolls of the placement office. Active files of experienced teachers would be kept. The placement service would secure professional advancement for them as soon as they are ready for it. Placement offices are criticized for not following beginning teachers into the field to determine how well they are succeeding and to keep files up-to-date. Superintendents seem to desire a continuous service. Expressions of the following types were common: "list all, both experienced and inexperienced," "check more closely on teachers in the field," and "keep lists of successful teachers to recommend for promotion."

3. **Information or data to be recorded.**—Expressions on this point indicate that superintendents want the present type of credentials continued and made more complete. They would also like to have access to additional types of information, such as a rating on standard tests to determine probable teaching ability. Personality, character, and trait ratings are also desired. Social, religious, and economic backgrounds are sought. Some statements that express this viewpoint are: "complete

information including personality, capabilities, moral character, and personal habits," and "more critical and reliable appraisals, particularly of student teaching."

4. **Thorough knowledge of the candidate.**—A general demand was made for more meaningful and complete records and more honesty in using them. Some of the expressions are: "very certain of recommendations," "more reliable credentials," "honest, complete, and correct data," "check more carefully on success," and "study habits, special abilities, and characteristics."

5. **Thorough and complete knowledge of area to be served.**—Placement officials are urged to make more frequent and more friendly contacts with the field conditions in the area to be served. More frequent visitation is urged. Among the expressions were: "know requirements of system and recommend accordingly," and "keep close contact with the field."

6. **Procedures for making contacts for recommendation.**—As to methods of making contacts with the field, some preferred only one candidate; others suggested open lists stating licenses, and general credentials. The larger number seemed to prefer a direct and definite call.

7. **Ethics.**—On points of ethics superintendents are quite generally agreed. They are requesting more certainty and more honesty in telling the whole truth about candidates. They desire all communications to be in confidence, and credentials to be sent only when requested.

8. **Personnel of placement bureau and techniques used.**—Superintendents suggest that the head of the placement service be someone who has had varied experience in employing teachers. Business-like methods, promptness, courtesy, and reliability are urged. "Have bureaus that are interested, active, and honest as to capabilities."

9. **Personal training in application technique.**—Superintendents would like to have students taught correct forms for application letters and schooled in the art of personal interview. "The majority are poor salesmen." It is suggested also that they be given better guidance earlier in their courses.

Superintendents were asked to rate 34 qualities or traits that were thought to be desirable for teachers to possess. An "A" rating indicates high importance, a "B" medium, and a "C" low. It is not claimed that this list is exhaustive. There may be many other qualities and traits that are equally desirable for teachers to possess. This list was compiled from teacher rating blanks from lists used in Minnesota and California for a similar purpose. In Table XVII these qualities are ranked in the order of total "A" ratings from all classes of schools.

It is interesting to note that moral qualities and personal characteristics stand at the head of the list. These superintendents rated "cooperation" as the most important quality; "character" as second; "moral standards" as third; "faithfulness" as fourth; "personality" as fifth; and "judgment and tact" as sixth. It is somewhat reassuring and grati-

TABLE XVII. QUALITIES ESPECIALLY SOUGHT BY SUPERINTENDENTS IN TEACHING CANDIDATES
(A = HIGH, B = MEDIUM, C = LOW RATING)

Qualities*	Below 1,000			1,000-4,999			5,000-9,999			10,000 and above			Total		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Coöperation	85	10	....	100	8	....	16	....	....	10	1	....	211	19	.....
Character	85	10	....	95	3	....	16	....	....	11	....	....	207	13	.....
Moral standards	81	11	....	90	7	....	16	....	....	10	1	....	197	19	.....
Faithfulness	78	16	1	91	12	....	13	3	....	10	2	....	191	33	1
Personality	79	12	....	90	10	....	13	3	....	8	....	....	191	27	.....
Judgment and tact	78	15	1	88	13	3	14	2	....	9	2	....	190	31	4
Professional attitude	74	23	....	87	21	1	12	4	....	10	1	....	183	49	1
Efficiency as a teacher	77	14	....	83	18	....	14	3	....	7	2	....	183	37	.....
Discipline	73	20	2	87	19	....	13	3	....	8	4	....	180	46	2
Interest in subject	76	12	....	81	22	1	12	4	....	10	3	....	177	41	1
Appearance	71	27	....	83	25	1	12	5	1	8	4	....	174	61	2
Resourcefulness	69	28	....	83	23	....	11	6	....	11	1	....	174	58	.....
Use of English	69	25	1	80	23	2	13	3	....	9	....	....	173	50	3
Classroom management	72	14	2	82	24	1	10	6	....	7	2	....	172	47	3
Adaptability as a teacher	73	14	2	73	25	....	11	5	1	11	1	....	168	44	3
Attitude	71	17	1	74	17	2	13	3	....	8	2	....	167	39	3
Teaching skill	63	26	1	71	25	1	11	5	....	10	1	....	154	58	2
Ability to express thought	63	33	1	70	36	....	10	6	....	7	4	....	150	79	1
Physical vigor	52	38	3	76	31	....	9	7	....	10	2	....	147	78	3
Sympathy	60	30	....	66	31	2	12	4	....	6	3	....	146	68	2

Intelligence	60	39	....	67	33	3	9	8	....	11	5	....	145	82	3
Knowledge of subject	59	30	2	63	33	1	10	6	....	7	3	....	140	72	3
Leadership	56	39	2	61	41	....	11	5	....	7	4	....	135	89	2
Poise	59	34	2	54	38	3	12	4	....	3	4	....	133	79	5
Temperament	53	39	....	58	38	3	8	8	....	6	4	....	124	90	3
General culture	51	38	1	51	45	1	7	7	2	8	4	....	116	94	4
Sense of humor	48	38	3	52	45	5	7	8	1	9	6	....	113	96	9
Ambition	43	43	2	54	36	7	5	10	1	6	4	....	109	93	10
Mastery of method	37	43	7	44	48	2	11	5	....	7	4	....	97	102	9
Interest in student activities	42	30	2	40	54	3	8	7	1	6	6	....	95	97	6
Background	41	43	7	37	47	12	3	12	1	7	5	....	87	107	20
Vivacity	34	49	9	34	57	5	4	12	....	7	6	....	77	124	14
Social qualities	32	48	10	27	68	5	6	8	2	5	4	1	70	129	18
Number of friends	19	61	17	8	66	24	4	10	4	5	6	3	33	143	48

*The study assumes that all qualities listed are important and that they bear some positive relation to teaching success. The order of the qualities was determined by the total of "A" ratings from all classes of schools. Attention is directed to the relatively high number of "B" and "C" ratings given to the few qualities that show a low number of "A" ratings. Qualities with low ratings are to be regarded as "less" desirable rather than "undesirable."

fying to find at the top these six traits that indicate high evaluation of moral fiber, teamwork, leadership ability, common sense, and courteous treatment of others. The old-fashioned virtues are still at a premium for teachers. They are the plus values. Educational leaders are not subordinating character to scholarship, teaching skill, friendships, or social qualities.

The rating of "number of friends" as thirty-fourth does not mean that superintendents regard it unimportant to form friendships. It merely means that a candidate's ability to teach is not in direct ratio to the number of friends that he may claim. As you examine this list keep in mind that all of these qualities are regarded as important and all of them were given "A" ratings by 33 or more superintendents returning ratings. As you study this list check your own judgment to discover points where you differ with the totals of the groups.

SUMMARY

In summarizing the views of the 290 superintendents we find that they favor increasing standards of professional training to a minimum of four years for elementary teachers and five years for high school teachers. Although experience is regarded as desirable, there is a marked trend toward city schools accepting beginners with good records. The age of the candidate is regarded as important, with a tendency to narrow the ranges of selection. Candidates with less than average record have a 50 to 50 chance of receiving consideration if they have good personalities, coöperative attitudes, and clean characters, and are industrious. Teachers with licenses in three or more subjects are sought by superintendents in preference to those with only one or two licenses. Properly licensed "out-of-state" and "non-local" teachers are often appointed. While there seems to be no unanimity of opinion on the ratio of "local" to "non-local" teachers, the ratio of highest choice was one "local" to three "non-local." Most superintendents are not recommending married women. Married men are preferred to single men. Superintendents desire candidates to have some religious affiliation. Citizens of the United States from smaller communities are favored for the teaching service. Membership in a college fraternity is of little or no value in securing a position. Teachers are expected to take special interest in extracurricular activities. Travel and study abroad are encouraged. Fifty per cent of the language teachers are required to have a speaking knowledge of the language which they teach. Few schools have a definite tenure policy. Personal habits are significant. Glaring physical or health disabilities usually bar candidates from consideration. There is a commendable tendency to give the placement bureaus of the training institutions the first call in filling a position. The customary procedure is to select applicants for personal interview through examination of credentials and letters of application. There is a tendency to eliminate experience as a requirement.

Superintendents hold that placement bureaus can increase their efficiency by having more complete records both of teachers in training and of teachers who are successful in the field. Frankness and

honesty in recommendations are urged. Placement officials should keep in close contact with conditions in the field. In evaluating traits, personal qualities are rated above scholarship and professional skill. The old-fashioned virtues are still at a premium in teacher selection.

A List of Bulletins in the Field of Education, Indiana University

The following is a list of the bulletins published by the School of Education, Indiana University.

All bulletins which are available at the present time may be secured for fifty cents ($.50) per copy, with the exception of the *Second Revision of the Bibliography of Educational Measurements;* the *Bibliography of School Buildings, Grounds and Equipment—Part I; The Philosophy of Human Relations—Individual and Collective;* the *Bibliography of School Surveys and of References on School Surveys;* and the *Bibliography of College and University Buildings, Grounds, and Equipment,* which may be secured for seventy-five cents ($.75) per copy. *The Philosophy of Human Relations—Individual and Collective* and all fifty-cent bulletins of the School of Education may be obtained from the University Bookstore. The other four bulletins should be ordered through the Bureau of Coöperative Research, Indiana University.

Proceedings of the High School Principals' Conference (November 23 and 24, 1923). Vol. I, No. 1, 1924. 35 p. (Supply exhausted.)

Investigation of Nursing as a Professional Opportunity for Girls. Part I, Technical Study; Part II, Vocational Information Bulletin. By Florence E. Blazier. Vol. I, No. 2, 1924. 69 p.

Proceedings of the Eleventh Conference on Educational Measurements. Vol. I, No. 3, 1925. 141 p.

Proceedings of the High School Principals' Conference (November 14 and 15, 1924). Vol. I, No. 4, 1925. 49 p. (Supply exhausted.)

First Revision of the Bibliography of Educational Measurements. Compiled by the Bureau of Coöperative Research. Vol. I, No. 5, 1925. 147 p. (Supply exhausted.)

Proceedings of the Twelfth Conference on Educational Measurements. Vol. I, No. 6, 1925. 76 p.

The Effect of Population upon Ability to Support Education. By Harold F. Clark. Vol. II, No. 1, 1925. 28 p.

Proceedings of the High School Principals' Conference (November 20 and 21, 1925). Vol. II, No. 2, 1925. 77 p. (Supply exhausted.)

A Cross-Indexed Bibliography on School Budgets. By Harold F. Clark. Vol. II, No. 3, 1926. 66 p.

A Comparison of the Results Made on Certain Standardized Tests by Pupils in the Bloomington High School Who Were Taught in Classes of the Same Grade by University Student Teachers and by Regular High School Teachers. By Carl G. F. Franzén. Vol. II, No. 4, 1926. 19 p.

Proceedings of the Thirteenth Annual Conference on Educational Measurements. Vol. II, No. 5, 1926. 103 p.

When to Issue School Bonds. By Harold Florian Clark and Paul Royalty. Vol. II, No. 6, 1926. 16 p.

Students' Attitude Toward Examinations. By Grover T. Somers. Vol. III, No. 1, 1926. 48 p.

Proceedings of the High School Principals' Conference (November 12 and 13, 1926). Vol. III, No. 2, 1926. 27 p.

Index Numbers in School Administration. By Harold F. Clark. Vol. III, No. 3, 1927. 35 p.

Topical Analysis of 23½ School Surveys. Compiled by the Bureau of Coöperative Research. Vol. III, No. 4, 1927. 111 p. (Supply exhausted.)

Proceedings of the Fourth Annual Conference on Elementary Supervision. Vol. III, No. 5, 1927. 64 p.

Proceedings of the Fourteenth Annual Conference on Educational Measurements. Vol. III, No. 6, 1927. 66 p.

Some Phases of the Junior College Movement. By I. Owen Foster, Harold F. Clark, Willard W. Patty, and Leo M. Chamberlain. Vol. IV, No. 1, 1927. 125 p. (Supply exhausted.)

Second Revision of the Bibliography of Educational Measurements. By Henry Lester Smith and Wendell William Wright. Vol. IV, No. 2, 1927. 251 p.

Bibliography of School Buildings, Grounds, and Equipment, Part I. By Henry Lester Smith and Leo Martin Chamberlain. Vol. IV, No. 3, 1928. 326 p.

Proceedings of the High School Principals' Conference (November 18 and 19, 1927). Vol. IV, No. 4, 1928. 54 p.

The Economic Effects of Education. By Harold F. Clark. Vol. IV, No. 5, 1928. 39 p.

Proceedings of the Fifteenth Annual Conference on Educational Measurements. Vol. IV, No. 6, 1928. 73 p.

Proceedings of the Fifth Annual Conference on Elementary Supervision. Vol. V, No. 1, 1928. 54 p.

Proceedings of the High School Principals' Conference (November 16 and 17, 1928). Vol. V, No. 2, 1928. 33 p.

The Development and Use of a Composite Achievement Test. By Wendell William Wright. Vol. V, No. 3, 1929. 90 p.

An Analysis of the Attitudes of American Educators and Others Toward a Program of Education for World Friendship and Understanding. By Henry Lester Smith and Leo Martin Chamberlain. Vol. V, No. 4, 1929. 109 p.

Tentative Program for Teaching World Friendship and Understanding in Teacher Training Institutions and in Public Schools for Children Who Range from Six to Fourteen Years of Age. By Henry Lester Smith and Sherman Gideon Crayton. Vol. V, No. 5, 1929. 54 p.

Proceedings of the Sixteenth Annual Conference on Educational Measurements. Vol. V, No. 6, 1929. 96 p.

Proceedings of the Sixth Annual Conference on Elementary Supervision. Vol. VI, No. 1, 1929. 73 p.

An Analysis of the Duties of County School Superintendents and Superintendents of Schools in Certain Cities in Indiana. By Henry Lester Smith and Leo Martin Chamberlain. Vol. VI, No. 2, 1929. 94 p.

Proceedings of the High School Principals' Conference (November 22 and 23, 1929). Vol. VI, No. 3, 1930. 51 p.

Coöperative Studies in Secondary Education. By Henry Lester Smith and Carl G. F. Franzén. Vol. VI, No. 4, 1930. 121 p.

Proceedings of the Seventeenth Annual Conference on Educational Measurements. Vol. VI, No. 5, 1930. 103 p.

Proceedings of the Seventh Annual Conference on Elementary Supervision. Vol. VI, No. 6, 1930. 102 p.

A Study in Teacher Supply and Demand in Indiana. By I. Owen Foster, Robert K. Devricks, Harry N. Fitch, Earl C. Bowman, and George L. Roberts. Vol. VII, No. 1, 1930. 77 p.

Proceedings of the High School Principals' Conference (November 7 and 8, 1930). Vol. VII, No. 2, 1930. 70 p.

The Philosophy of Human Relations: Individual and Collective—A Source Book. By Henry Lester Smith and Harold Littell. Vol. VII, No. 3, 1931. 326 p.

The Psychology of Human Relationships: Individual and Social—A Source Book. By Henry Lester Smith and Levi McKinley Krueger. Vol. VII, No. 4, 1931. 107 p.

Proceedings of the Eighteenth Annual Conference on Educational Measurements. Vol. VII, No. 5, 1931. 83 p.

Efficiency in College Management. By John Dale Russell. Vol. VII, No. 6, 1931. 143 p.

Bibliography of School Surveys and of References on School Surveys. By Henry Lester Smith and Edgar Alvin O'Dell. Vol. VIII, Nos. 1 and 2, 1931. 212 p.

Proceedings of the Nineteenth Annual Conference on Educational Measurements. Vol. IX, No. 1, 1932. 139 p.

Bibliography of School Buildings, Grounds, and Equipment—Part II. By Henry Lester Smith and Forest Ruby Noffsinger. Vol. IX, No. 2, 1933. 182 p.

Bibliography of School Buildings, Grounds, and Equipment—Part III. By Henry Lester Smith and Forest Ruby Noffsinger. Vol. IX, No. 3, 1933. 130 p.

A Brief Summary of Literature on Leadership. By Henry Lester Smith and Levi McKinley Krueger. Vol. IX, No. 4, 1933. 80 p.

Proceedings of the Twentieth Annual Conference on Educational Measurements. Vol. X, No. 1, 1933. 98 p.

Bibliography of College and University Buildings, Grounds, and Equipment. By Henry Lester Smith and Forest Ruby Noffsinger. Vol. X, No. 2, 1934. 199 p.

Factors Affecting the Organization of School Attendance Units. By Raleigh Warren Holmstedt. Vol. X, No. 3, 1934. 32 p.

The Old World Historical Background of Religious and Moral Education in Schools. By Henry Lester Smith, Robert Stewart McElhinney, and George Renwick Steele. Vol. X, No. 4, 1934. 144 p.

Proceedings of the Twenty-first Annual Conference on Educational Measurements. Vol. XI, No. 1, 1934. 96 p.

Bibliography of School Buildings, Grounds, and Equipment—Part IV. By Henry Lester Smith and Forest Ruby Noffsinger. Vol. XI, No. 2, 1935. 216 p.

A Brief Survey of Present-Day Religious and Moral Education in the Schools of Countries Other Than the United States of America. By Henry Lester Smith, Robert Stewart McElhinney, and George Renwick Steele. Vol. XI, No. 3, 1935. 185 p.

Some Practical Efforts to Teach Good Will. By Henry Lester Smith and Peyton Henry Canary. Vol. XI, No. 4, 1935. 169 p.

Twenty-second Annual Conference on Educational Measurements. Vol. XII, No. 1. 1935. 97 p.

A Basis for the Improvement of Education in Rural Monroe County, Indiana. By Henry Lester Smith and Forest Ruby Noffsinger. Vol. XII, No. 2, 1936. 168 p.

Reading Readiness—A Prognostic Study. By Wendell William Wright. Vol. XII, No. 3, 1936. 46 p.

Proceedings of the Twenty-third Annual Conference on Educational Measurements. Vol. XII, No. 4, 1936. 60 p.

Bibliography of Literature on the Teaching of English. By Henry Lester Smith and William Isaac Painter. Vol XIII, No. 1, 1936. 299 pp.

Bibliography of Literature on Education in Countries Other Than the United States of America. By Henry Lester Smith and William Isaac Painter. Vol. XIII, No. 2. 1937 341 p.

Character Development through Religious and Moral Education in the Public Schools of the United States. By Henry Lester Smith, Robert Stewart McElhinney, and George Renwick Steele. Vol. XIII, No. 3, 1937. 137 p.